



DANISH
TECHNOLOGICAL
INSTITUTE

Chemical analysis of boar taint

Quality assessment of meat from
entire male pigs

DANAK accredited analysis · ISO 17025

Chemical analysis of boar taint

Danish Technological Institute offers accredited quantitative analysis of skatole and androstenone, enabling objective sorting of carcasses and ensuring that meat from entire male pigs can be sold without customer complaints.

What is boar taint?

The production of entire (non-castrated) male pigs offers several advantages: improved feed conversion efficiency, higher meat yield, and enhanced animal welfare by avoiding castration. However, this production method carries a risk of boar taint, which develops in some entire male pigs depending on a range of factors, including genetics, feed, housing management, and slaughter weight. Generally, the term 'boar taint' encompasses both the odour and flavour associated with tainted meat from entire male pigs. Boar taint is primarily caused by two compounds, skatole and androstenone, which accumulate in the adipose tissue of the pig.

The two compounds responsible for boar taint

SKATOLE

Skatole is a degradation product of the amino acid tryptophan, which the pig ingests through the feed.

Skatole is the most volatile of the two compounds and is released particularly during cooking of the meat. Most people can detect skatole, and the odour is often described using terms such as 'faecal' and 'manure-like'. The threshold value is approximately 0.20 – 0.25 ppm.

ANDROSTENONE

Androstenone is a pheromone produced in connection with sexual maturation in entire male pigs. Androstenone is released from the meat during heating; however, not everyone is able to perceive the compound (this is genetically determined). Individuals who can detect androstenone often find it highly unpleasant, describing the odour with terms such as 'urine', 'urinal' and 'chemical'. The threshold value is approximately 0.5 – 1.0 ppm.

There is no direct correlation between the concentrations of the two compounds formed in entire male pigs, and it may therefore be advantageous to measure both.

In addition, it is well established that indole is also associated with boar taint, although indole concentration is most often linked to the concentration of skatole. Most recently, 2-aminoacetophenone has been identified as a contributing compound to boar taint (Mörlein et al., 2024, Meat Science).

Variable consumer sensitivity supports the case for objective measurement

Consumer sensitivity towards the two odour compounds varies considerably. Most consumers can detect skatole, whereas a relative proportion of the population is able to perceive androstenone. In 2015, Danish Technological Institute conducted a screening of 1,970 Danish consumers' sensitivity. The study found that approximately 30 % were sensitive to androstenone, corresponding to approximately 590 consumers (with a higher proportion of women than men). Similar studies conducted in other European countries have produced comparable results (Blanch et al., 2012, Meat Science; Aluwe et al., 2018, Meat Science).

Although two-thirds of the consumers cannot detect androstenone, it is the remaining one-third who may ultimately determine whether pork is chosen for the dinner table.

Several consumer studies have also assessed liking of meat from entire male pigs, revealing a clear reduction in liking associated with increased skatole and/or androstenone content (the latter particularly among androstenone-sensitive consumers).

The risk of a negative eating experience may lead to reluctance among some consumers to purchase pork. This uncertainty highlights the importance of analysing carcasses for these odour compounds and sorting the meat accordingly, to ensure that consumers do not experience reduced eating quality due to boar taint.

How can tainted meat be utilised?

Danish Technological Institute has investigated a range of selected strategies for utilising tainted meat, with a primary focus on processed meat products. Generally, smoking is effective in masking the odour, and serving processed meat products cold also reduces the perceived intensity of boar taint.



The analysis

We quantify skatole and androstenone simultaneously in a single selective analysis, performed under DANAK accreditation. The laboratory operates in accordance with ISO 17025.

Accredited analysis based on LDTD-MS/MS (Laser Diode Thermal Desorption, tandem mass spectrometry).

The method achieves a reproducibility of RSD < 10 %.

The limit of quantification (LOQ) is 0.05 µg/g for skatole and 0.10 µg/g for androstenone.

WHY CHOOSE DANISH TECHNOLOGICAL INSTITUTE

Pioneers in boar taint detection

The Chemical Laboratory has pioneered the development and implementation of chemical methods for boar taint detection, from skatole analysis based on liquid chromatography (HPLC) in the 1990s to the current analysis of skatole and androstenone based on mass spectrometry (LDTD-MS/MS).

We combine more than 30 years of research into boar taint with accredited analysis,

providing advice on detection methods, proposed sorting thresholds based on measured consumer response, and strategies for the utilisation of tainted meat from entire male pigs.

We can help you with

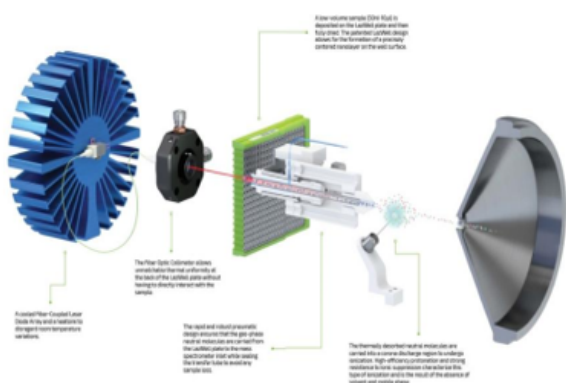
- Accredited quantification of skatole and androstenone (and indole on request)
- Proposals for sorting thresholds, calibrated to your market
- Strategies for the utilisation of meat affected by boar taint

Sampling and shipment of fat samples

- Collect a fat sample from the neck fat, approximately 5 × 10 cm, 2 cm deep (back fat may also be used)
- Vacuum-pack the fat sample
- Ship samples frozen

READ MORE HERE

www.dti.dk/services/chemical-analyses-of-boar-taint-in-male-pigs/45205





**Send us a sample, and
receive a valid result.**

Danish Technological Institute · Chemical Laboratory · Taastrup

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www.dti.dk

Selected references

Mörlein, D., Mörlein, J., Gerlach, C., Strack, M., Kranz, B., Brüggemann, D.A. (2024). An overlooked compound contributing to boar taint and consumer rejection of meat products: 2-Aminoacetophenone. *Meat Science*, 213: 109497. Lund, B., Borggaard, C., Birkler, R., Jensen, K., Støier, S. (2021). High throughput method for quantifying androstenone and skatole in adipose tissue from uncastrated male pigs by laser diode thermal desorption-tandem mass spectrometry. *Food Chemistry*, vol. 9, 100113. Borggaard, C., Birkler, R., Meinert, L., Støier, S. (2017). At-line rapid instrumental method for measuring the boar taint components androstenone and skatole in pork fat. ICoMST. Lund, B., Meinert, L., Borggaard, C. (2016). Simultaneous detection of off-note or boar taint related compounds in animal tissue. Patent WO/2016/139291. Hansen-Møller, J. (1994). Rapid HPLC method for simultaneous determination of androstenone, skatole and indole in back fat from pigs. *Journal of Chromatography B*, 661, 219–230.