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Boar taint – challenges and opportunities

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Boar Taint

An offensive odour in the meat of 5-10% of uncastrated male pigs is mainly due to excessive accumulation of skatole and androstenone in pig adipose tissue.
Adipose tissue
Skatole
Androstenone

Gut
Skatole

Testes
Androstenone

Liver
Metabolism

Excreted metabolites

Salivary glands
Situation in the UK

• Surgical castration was phased out in the UK and Ireland during the 1980s

• Low slaughter weight

• Boar taint cannot be fully eliminated by early slaughter
EU position

EU Directive on castration without anesthesia during the first week of life (2001/93/EC)

Plan to voluntarily end surgical castration by 1 January 2018 (EU SANCO, 2010)

European Partnership on Alternatives to Surgical Castration of Pigs Established (http://ec.europa.eu/food/animal/welfar)
Estimated economic losses in Europe associated with raising entire male pigs

- Current: 78.6 m Euro
- 2018: 393 m Euro

(EU Tender ALCASDE)
Potential solutions

- **Alternatives** to surgical castration to prevent boar taint

- **Technologies** for rapid detection of boar taint

- Effective **meat processing** technologies
Prevention of Boar Taint

- Surgical Castration
- Genetic selection
- Immunocastration
- Management/Diet
- Slaughtering at Lower weight
- Semen Sorting
“There are no harmonised methods of consistently identifying carcases with boar taint in commercial slaughter houses. Investigation of possible processing techniques to reduce the offensive properties of boar taint is hampered by the lack of such methods to assess levels of the compounds contributing to the phenomenon”

(The EFSA Journal, European Food Safety Authority, 2004)

<table>
<thead>
<tr>
<th>Existing methods (examples)</th>
<th>Technoloiges Under Development (examples)</th>
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<tr>
<td>Spectrophotometric</td>
<td>Chemical sensor-base and gas sensor-based technologies (i.e. Haugen, 2006; Vestergaard et al., 2006)</td>
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<td>(Mortensen and Sorensen, 1984)</td>
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<td>Immunoassay</td>
<td>Bio-sensors</td>
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<td>(Claus et al., 2008; Tuomola et al., 1997)</td>
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<td>Gas and liquid chromatography</td>
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<td>(Annor-Frempong et al., 1997; Garcia-Regueiro and Diaz, 1989)</td>
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Novel Technologies for Food Quality developed at the University of the West of England have been listed among the top 100 areas which will have a profound effect on our future in the Research Council UK report “Big Ideas for the Future”, 2011
Examples of recent initiatives

EU ALCASDE Project “Study on the improved methods for animal-friendly production, in particular on alternatives to the castration of pigs and on alternatives to the dehorning of cattle”

EU: Health and Consumers Directorate General Tender “Study on rapid detection methods for boar taint used or being developed at slaughter plants in the European Union”

“UK/China partnership for innovative technologies”.
UK-China partnership for innovative technologies

Funder: UK Biotechnology and Biological Sciences Research Council (BBSRC)

Leading organisation: University of the West of England

Aims:
- To develop collaborative research and knowledge exchange in the area of novel technologies for food quality and safety
- To enhance links between industry and academia
- To develop UK/China staff exchange schemes

http://rbi.uwe.ac.uk/chinapartnership/default.asp
Advantages of biosensors

☑ Rapid
☑ Cost-effective
☑ Point-of-test analysis
☑ User-friendly
☑ Simultaneous multiple analysis
☑ Portable
☑ Can be adapted to other applications
☑ Display the results immediately
Examples of Bio-sensors developed at the Centre for Research in Biosciences (University of the West of England)
Gas sensors for detection of soft rot and Parma ham spoilage
Bio-sensors for detection of organophosphate pesticides

Commercially available portable device (Uniscan Instruments, UK)
Carbon Bio-sensor System for detection of ammonia

Commercially available automated instrument (AET Ltd., UK)
Bio-luminescent bacteria based sensors

Roger J. Lewis, Adam Baldwin, Tracey O'Neill, Habib A Alloush, Shona M Nelson, Tony Dowman, Vyv Salisbury,

Journal of Food Engineering 2006 Vol 76 Pages: 41-48
Other applications

- Glucose and lactate biosensors
- Heavy metal sensors for liquids
- Bio-sensors for progesterone and estradiol in milk
- Magnetic immunoassay for food quality traits
What is the scale of the market?

How much is industry prepared to pay?

What are the end-users requirements to the technology?

How to incorporate the new technology in industrial setting?
Conclusions

EU legislations and initiatives emphasise the need in on-line detection of boar taint

The need in boar taint detecting technology vary between countries and the sectors. A comprehensive market assessment is needed.

A number of technologies for on-line boar taint detection are at various stages of development. Evaluation in industrial setting is essential.

Harmonization of existing methods for boar taint detection is essential.