

Oral presentation

The Norwegian Research Programme for Entire Male Pig Production

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Background

Until 2002, castration of male piglets in Norway was routinely performed, mainly by the pig producers themselves, without any requirements for anaesthesia or analgesia. The only restriction was that the piglets should not be older than 28 days. In 2002 the Norwegian Parliament passed a law, prohibiting castration of piglets from 2009. At the same time it was decided that until 2009, the castration of piglets in Norway should be performed only by veterinarians, and that use of anaesthesia should be mandatory. The argument for the decisions was animal welfare. The meat industry, and the pig breeding association Norsvin, have co-operated with the research institutions and the Research Council of Norway to establish a research programme for entire male pig production. The main aim of the programme is to ensure that the ban on castration can be accomplished without large negative consequences for the industry and the pig producers, and that the consumers after 2009 still will be offered high quality pork without boar taint.

Economical consequences

The economical consequences of the decision are difficult to estimate because the percentage of tainted carcasses that will have to be sorted out at the slaughter line when castration is prohibited, is unknown. Former estimates have been that 30 – 40% of the male carcasses will have too high levels of androstenone and/or skatole. Recent results from a project at the Norwegian Meat Research Centre indicate that the numbers might be even higher. It has been calculated that the yearly loss for the pig producers will be 1.2 mill Euro for each percentage sorted out, which corresponds to 1 Euro/slaughtered pig. In addition

there will be costs for detection assays and increased costs at the slaughterhouses. Lost market shares for the pork industry because of consumer complains, is also a likely consequence if tainted meat reaches the consumers. The costs of this could be considerable, but are difficult to estimate.

National priorities

In 2003, a report was written as a basis for the research programme (in Norwegian). In the report recommendations were given for national priorities within the programme. The necessity of reducing the percentage of tainted carcasses, as well as developing on-line methods for detection, and solutions on how to use tainted meat was emphasised. In a long-term view, genetic research and selective breeding is probably the best way to control the levels of androstenone and skatole. Such research is done on a national population level, and any progress will benefit all pig producers in Norway. However, research on genetics is time consuming, and other approaches with a potential of more rapid progress are also required. With regard to skatole, feeding regimes, in particular special feeding regimes in the last weeks before slaughter, seem to have such potential. There is consensus in Norway that both skatole and androstenone levels in the carcasses need to be below certain limits. The cut-off limits, however, are not yet decided, because we still know too little about the Norwegian consumers' perception of boar taint. Because there already exists an on-line method for skatole, research within detection will focus on on-line methods for androstenone or on-line methods that measure both androstenone and skatole (and possibly also other compounds).

Immunocastration and sex separation of semen are potential ways to reduce the necessity for castration. These fields are not given priority in the research programme. For sex separation of semen, the probability of successful research within 2009 was regarded as low. Immunocastration on the other hand is a method that is already shown to be effective. There is, however, uncertainty about the approval of the method in Europe, and to what extent the Norwegian consumers will accept it. At the moment, local anaesthesia is used when piglets are castrated in Norway. Because this is a practice of limited duration, as castration will be forbidden from 2009, research on methods for anaesthesia is not given any high priority within the programme.

The national research programme

The national research programme started in 2004, and will run until January 1st 2009. It is divided into two periods; 2004–2006 and 2007–2008. For the first period, funds have been granted for five different projects. At the end of the period, an evaluation of the programme and the different projects will be performed. For the second period funds have been proposed, but the final allocation will be done after the evaluation. Extensive co-operation between the different projects is demanded to utilize data and resources in the best way.

The programme is financed by three sources; The Research Council of Norway, a fund built on the purchase tax and research funds from the Ministry of Agriculture with one third each. For the first period, 18 mill. NOK is granted (2.2 mill. Euro), and for the second period 27 mill. NOK is proposed (3.3 mill. Euro). In addition considerable resources are put into the projects at the project owners own risk.

The projects in the programme

Genetics in boar taint (Norsvin)

The aim of the project is to combine knowledge from other studies, and use of new methods in genome research to identify genetic factors affecting boar taint and to study complex interactions between genes. Levels of androstenone and skatole should be reduced while levels of testosterone and fertility should be unchanged. The goal is to implement the results in breeding as soon as possible. The following methods will be included:

- Quantitative genetics
- Proteomics and functional genomics
- Characterisation of candidate genes
- Transcript profiling

- Genome scan
- Genetic network modeling

Testicular activity in the boar related to the occurrence of 5 α -androstenone in fat (The Norwegian School of Veterinary Science)

The aim of the project is to identify boars with low levels of androstenone in plasma and adipose tissue for the selection of boars with low tainted meat but with normal anabolic potentials, normal sexual maturation and normal reproductive function. Sub-aims of the project will be

- Obtain more information about the production of testicular steroids
- Identify boars with low capacity to produce androstenone and normal production of testosterone
- Elucidate the relationship between levels of testicular steroids and testicular morphology
- Elucidate a possible binding of androstenone to plasma proteins

In vivo stimulation of testicular steroidogenesis with human chorionic gonadotropin (hCG) and evaluation of spermatogenesis by histology and flow cytometry analyses are methods that will be used in the project.

Entire male pigs – feeding and managing (Norwegian Meat Research Centre and The Agricultural University of Norway)

The project focuses on efforts to be done within the herds to reduce the levels of androstenone and skatole in the carcasses. It will also evaluate the effect of the different raising methods on animal welfare. The following sub-projects are included:

- feeding with organic acids (period I)
- artificial light programmes (period I)
- stable social groups (period I+II)
- feeding with grain with high levels of beta-glucan (period II)
- restricted feeding (period II)
- feeding raw potatoe starch under practical conditions (period II)

**Rapid sorting methods for sorting boar carcasses
(Norwegian Food Research Institute)**

The main objective of the project is to develop rapid method(s) for detection of boar taint for use on the slaughter line. The project is divided into three sub-projects with the following subgoals:

- Identification of relevant rapid methods for pointing out male pig carcasses on the basis of androstenone, skatole and boar taint levels. (International workshop October 2004)
- Practical evaluation of a number of methods given priority in the workshop, concluding in 1 or 2 methods for further development
- Mapping and identification of other possible chemical markers correlated with boar taint, which can be used for sorting boar carcasses
- Development of rapid method(s) for detection of boar taint at the slaughter line

**Boar meat – consumer aspects and resource utilization
(Norwegian Meat Research Centre)**

The first two years the project will focus on the Norwegian consumers and their reaction to boar meat. The sensitivity for androstenone and acceptance for tainted meat will be addressed. It will be important to work out cut-off limits for androstenone and skatole levels based on Norwegian pork and Norwegian consumers' perception of boar taint. In the last period different approaches to utilization of tainted meat will be investigated. This will include for example mixing of tainted meat with other meat in different products, and marinating (or other procedures) to mask boar taint.

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