

Opinion of the Scientific Panel on Animal Health and Welfare on a request from the Commission related to welfare aspects of the castration of piglets¹

(Question N° EFSA-Q-2003 - 091)

Adopted on the 12th and 13th July 2004

SUMMARY OF OPINION

The EFSA Scientific Panel on Animal Health and Welfare was invited by the EU Commission to draw up an opinion on the Welfare Aspects of Piglet Castration.

According to the mandate of EFSA, ethical, socio-economic, cultural and religious aspects are outside the scope of this Opinion

Male piglets are castrated primarily to prevent the development of the objectionable sensory perceived odour or flavour of boar taint in their carcasses. While castration may be legally performed without anaesthetics prior to seven days of age available evidence suggests that castration at any age is painful. Few anaesthetics or analgesics are licensed for use in piglets. As general and epidural anaesthesia necessitate expert knowledge and are labour intensive, the use of local anaesthesia offers the best practical prospects for pain alleviation in piglets. There is some evidence that surgically castrated piglets may be more prone to disease conditions than gilts or entire males. Intratesticular injection of agents designed to destroy testicular tissue is a possible option for castration that needs investigation from a welfare and boar taint reduction perspective. Immunocastration is carried out in a high proportion of male pigs in Australia. The advantages of the growth properties of entire males and the reduction in boar taint in carcasses may be achieved by using this procedure during the fattening period. However the acceptability of the procedure among Europeans needs to be evaluated.

Piglet castration is not carried out in Ireland and the UK and pigs are slaughtered at live weights lower than 100 kg. yet there are viable pig industries in these countries. While slaughtering at lower live weights may reduce the chances of carcasses having boar taint the practice cannot be considered to be one hundred *per cent* successful.

There is evidence that management practices such as batch rearing, use of particular feed ingredients and prevention of pigs wallowing in excrement may contribute to the reduction of boar taint. Careful selection for animals with reduced levels of androstenone may also help.

There are no harmonised methods of consistently identifying carcasses 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.

Key words : Piglets, castration, animal welfare, anaesthesia, analgesia, pain, boar taint, androstenone, skatole, immunocastration

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BACKGROUND

The EFSA Scientific Panel on Animal Health and Welfare (AHAW) was asked by the Commission services to report on the welfare aspects of the castration of piglets on 6th August 2003.

The mandate was accepted by the AHAW Panel at the 2nd Plenary Meeting, on 30th September and 1st October 2003. It was decided to establish a Working Group of AHAW experts chaired by one Panel member. Therefore the Panel entrusted a Scientific Report to a working group under the Chairmanship of Michael Gunn.

This opinion has been adopted by the Plenary Meeting of the AHAW Panel on the 14th and 15th July 2004 and the relevant conclusions and recommendations are based on the Scientific Report separately published on the EFSA web site <http://www.efsa.eu.int>, which was drafted by the Working Group and accepted by the Panel.

TERMS OF REFERENCE

The EFSA Panel on Animal Health and Welfare was asked to report on the welfare aspects of the castration of piglets.

Council Directive 2001/88/EC amended Council Directive 91/630/EEC laying down minimum standards for the protection of pigs. In particular it requires the Commission to submit to the Council a report, based on a scientific opinion, concerning the castration of piglets. The scientific opinion should also consider the development of techniques and systems of pig production and meat processing which would be likely to reduce the need to resort to surgical castration.

The Commission's report based on this scientific opinion is required to be submitted to the Council preferably before 1 January 2005 and in any event by 1 July 2005. The Commission's report will be drawn up also taking into account socio-economic consequences, sanitary consequences, environmental effects and different climatic conditions concerning this issue.

Commission Directive 2001/93/EC also amended Council Directive 91/630/EEC and provides that the castration of male pigs may only be performed by means other than tearing of tissues. In addition, when carried out after the seventh day of life it shall only be performed under anaesthetic and additional prolonged analgesia by a veterinarian.

In view of the above, the Commission asks the European Food Safety Authority to issue a scientific opinion on the welfare aspects of the castration of piglets. The scientific opinion should describe:

- Welfare aspects of various methods for the castration of piglets, including methods of analgesia and anaesthesia and consequences for animal health,
- The state of art concerning techniques and systems of pig production and meat processing which would be likely to reduce the need to resort to surgical castration, and the impact of the castration, or other alternative methods, on the organoleptic characteristics / quality of the meat.

ASSESSMENT

A full assessment can be found in the Scientific Report published in the EFSA web site <http://www.efsa.eu.int>, which was drafted by a Working Group set up by the AHAW Panel. The Scientific Report is considered as the basis for the discussion to establish the conclusions and recommendations by the AHAW Panel, as expressed in this opinion.

CONCLUSIONS AND RECOMMENDATIONS

According to the mandate of EFSA, ethical, socio-economic, cultural and religious aspects are outside the scope of this Opinion.

The Scientific Panel on Animal Health and Welfare concludes on the welfare aspects of the castration of piglets as follows:

1. GENERAL

1.1. CONCLUSIONS

Available information indicates that approximately 80% (100 million) of the male piglets are castrated in the 25 EU member states each year, however information on the castration of piglets from some countries is sparse.

Commission Directive 2001/93/EC, amending Council Directive 91/630/EEC, provides that the castration of male pigs may only be performed by other means than tearing of tissues. However, it is impossible to surgically castrate a male pig without tearing tissues e.g. the *gubernaculum testis*, spermatic cord. Moreover, the tearing of tissues is required to stem any haemorrhage from the retained part of the cord as otherwise the welfare of animals would be seriously jeopardised through haemorrhage and, in pigs with a congenital hernia, could result in an intestinal prolapse. It is clear therefore, that on this point the Directive is being widely ignored for both practical and welfare reasons by those who are castrating male pigs.

Castration of female pigs although less widespread, also cannot be carried out with considerable tissue damage through tearing.

While it appears that low numbers of female pigs are castrated there is also a lack of information concerning the extent of, and techniques associated with castration of female pigs.

Some countries have a viable pig industry without castrating male and female pigs used for fattening. However, as slaughter weights increase, the risk of producing carcasses with boar taint increases.

Puberty is accompanied by an increase of boar taint related compounds, but such compounds can be present in some animals before puberty.

Slaughter of fattening male pigs usually occurs after puberty, whereas females are usually slaughtered before puberty. For some specialised systems of meat production, slaughter of fattening female pigs may occur after puberty.

1.2. RECOMMENDATIONS

Because puberty is a gradual process and the development of boar taint variable, puberty should not be used as an indicator of the time of slaughter in order to avoid boar taint.

2. CASTRATION OF PIGLETS

2.1. HISTORY AND EXTENT OF THE CURRENT PRACTICE

2.1.1. CONCLUSIONS

Surgical castration of pigs is a very old practice.

There is a lack of quantitative information regarding the methods and procedures that are used for castrating the male and female pigs (e.g. who is performing castration, use of analgesia and anaesthesia, age at castration, etc).

2.1.2. RECOMMENDATIONS

Gaining information on castration rates, etc., may influence any decisions on management being undertaken at an EU wide level.

2.2. PHYSIOLOGY AND IDENTIFICATION OF PAIN

2.2.1. CONCLUSIONS

The pain process is complex. It involves endogenous mechanisms of control (inhibition of nociceptive information transmission and of pain perception) that are likely to mature after birth. Age-related variations in these mechanisms and innervation of the various tissues involved in castration are not known in the neonatal pig. Piglets respond to potentially painful stimuli very soon after birth.

Several physiological and behavioural measures can be used as pain indicators.

2.3. SURGICAL METHODS OF CASTRATION

2.3.1. CONCLUSION

Castration involves cutting the skin, pulling and cutting the spermatic cords. Under commercial conditions the practice is generally carried out very rapidly (in less than 30 seconds) in piglets under 7 days of age, generally without anaesthesia and analgesia. There is information that a variety of procedures are used to surgically castrate piglets.

2.3.2. RECOMMENDATION

Dir 2001/93/EC requiring training of all operatives likely to castrate pigs should be enforced.

2.4. HEALTH AND WELFARE IMPLICATIONS OF SURGICAL CASTRATION WITHOUT ANAESTHESIA AND ANALGESIA.

2.4.1. CONCLUSIONS

Castration is painful, regardless of the surgical procedure. Physiological and behavioural reactions indicative of pain are numerous during the process and in the first hours following surgery but decrease thereafter. Some behavioural alterations persist for several days, indicating that animals suffer from long-term pain.

Castration may have detrimental effects on growth, on the immune system and hence on the health of animals. Published data are not sufficiently comprehensive to make an opinion on health consequences and mortality rate in commercial herds associated directly with castration or indirectly with possible post-castration infections.

There are no clear data demonstrating that pain perception related to surgical castration is lower in pigs younger than 7 days of age than in older ones. Castration during the neonatal period (1-3 days) may have more deleterious consequences (growth rate, hernia detection and occurrence, testicular retention, pain) than later.

There is no information concerning the interaction between castration and other painful husbandry practises (tail docking, tooth shortening, ear notching, etc.).

Castration reduces undesirable behaviours such as aggressive and sexual behaviours (see chapter 3).

2.4.2. RECOMMENDATIONS

Information on the possible detrimental effects on growth, on the immune system and hence on the health of animals should be collected in order to quantify the risk associated with castration

The age limit of 7 days for castration without anaesthesia plus prolonged analgesia may need to be revised, including consideration of the neonatal period, as castration at any age is likely to be painful.

Information on the welfare implications of the interactions of combined surgical procedures would be useful prior to recommendations being made on the advisability of combining such procedures.

2.5. HEALTH AND WELFARE IMPLICATIONS OF SURGICAL CASTRATION WITH ANAESTHESIA AND ANALGESIA.

2.5.1. CONCLUSIONS

There are a limited number of anaesthetics specifically licensed in EU for pigs.

General anaesthesia has numerous drawbacks: cost, time consuming, problems of safety for animals and people

Local injection of lidocaine into the testis and/or in the spermatic cord with or without subcutaneous injection is effective in reducing acute pain induced by castration.

Advantages (less pain at castration) and drawbacks (more handling, pain due to injection, side effects) of local anaesthesia have not been evaluated on a large scale of piglets under commercial conditions.

There is no validated protocol for use of long-lasting analgesics which could be applied in commercial herds for reducing mid and long-term pain due to castration.

2.5.2. RECOMMENDATIONS

Although it is not possible to recommend a method of general anaesthesia for pigs undergoing castration in commercial farms at the present time, local anaesthesia should be used for castration of piglets. Analgesia should be used to prevent pain in piglets which are castrated.

2.6. CASTRATION OF FEMALE PIGS

2.6.1. CONCLUSIONS

The routine surgical castration of female pigs for reasons other than diagnostics and therapeutics purposes is not currently allowed by Directive 2001/93/EC amending Directive 91/630/EEC. However, it is believed that castration of female pigs is carried out in a small proportion of pigs in some countries.

2.6.2 RECOMMENDATION

If castration of female pigs is necessary for diagnostic reasons or therapeutic purposes, anaesthesia and analgesia should be used.

3. PRODUCTION OF ENTIRE MALE PIGS

3.1. CONCLUSIONS

Entire males are more aggressive than castrates and females and also perform mounting behaviour from an early age.

Entire males mount both females and other males.

It has been postulated that entire males are more susceptible to stress than castrates and females.

Entire adult males may need different housing conditions when sexually mature.

Fighting causes carcass damage and reduces meat quality in entire males.

Entire males are more efficient food converters than castrates, however carcasses from entire males have less fat, but the fat is soft, which results in a processing problem

The assumptions underlying calculations on the advantages and disadvantages of producing entire males are not static – and need regular updating. They will also differ between countries.

The lower lipid content and the higher content of unsaturated fatty acids in adipose tissues of entire males may be regarded as favourable from the human dietetic point of view.

The decreased adipose tissue content of meat cuts from entire males makes them more appealing to the consumer. The characteristics of muscle and adipose tissue differ between entire males and castrates.

3.2. RECOMMENDATIONS

It is important to avoid mixing of entire males as they are more aggressive and fight more than castrates.

Animals from different groups should not be mixed in preparation for or during transport and lairage.

Soft fat can be avoided by changing the fatty acid composition of the diet. However, such unsaturated fat may have nutritional advantages for human consumption.

4. BOAR TAIN

4.1. CONCLUSIONS

Skatole and androstenone are the main compounds associated with boar taint. The possible contribution of other compounds is unresolved.

There is no standardised chemical and sensory method for measurement of chemical compounds contributing to boar taint.

The sensory description of boar taint is not clear.

There is a lack of clarity with respect to anosmia to boar taint in human populations

Official criteria for inspectors to accept/reject limits for boar taint on slaughter lines are not established unequivocally.

Carcass accept/reject criteria are not fully established with respect to consumer accept reject limits especially in the different EU countries.

4.2. RECOMMENDATIONS

There is a need to evaluate and harmonize sensory evaluation and chemical measurements for boar taint.

Criteria aimed at avoiding boar taint, for the acceptance or rejection of pig carcasses in slaughterhouses should be revised as knowledge improves.

5. CONTROL OF TAIN: ANTE MORTEM

5.1. MANAGEMENT

5.1.1. CONCLUSIONS

The social environment and social factors of pigs have an effect on boar taint:

Strongly tainted dominant individuals in a group do not inhibit sexual development and development of boar taint in subordinates - on the contrary, they seem to stimulate it

Entire males raised in litters that are kept together from birth to slaughter seem to fight less and have less boar taint

Results relating to the effects of the social rearing environment on boar taint are inconsistent. Sex segregated rearing does, in some cases, result in lower levels, especially at high weights

It has been postulated that entire males are not sensitive to the odour of androstenone. Sensitivity may be age-related.

The risk of boar taint is reduced by slaughtering at a lower weight but is not completely removed within the commercial slaughter weight ranges. Low slaughter weight *per se* does not seem to be a solution to reducing boar taint, possibly due to individual and breed differences in the rate of sexual development.

Skatole from soiled floors can be absorbed through the belly skin of pigs.

5.1.2. RECOMMENDATIONS

Pigs should be mixed as little as possible - ideally litters should be kept intact from birth to slaughter.

With present knowledge, slaughtering pigs at a lower weight or age to avoid boar taint can not be recommended.

Pens floors should be kept clean, especially during the week before slaughter, and in warm periods pigs should have possibility for thermoregulation other than wallowing in excreta

5.2. NUTRITION AND DIET

5.2.1. CONCLUSIONS

High energy feeding may increase levels of both androstenone and skatole at live weights around 100 kg.

Skatole, but not androstenone, can be controlled by feeding special diets and feed additives close to slaughter. Stimulating production of indole instead of skatole could be possible.

5.3. GENETICS

5.3.1. CONCLUSIONS

Androstenone and skatole both have medium to high heritability, yet genetic markers have not been fully defined.

It has been established that breeds differ in concentrations of androstenone and skatole.

Strong negative genetic correlations exist between androstenone and reproduction traits however, no adverse relationships with production have been identified as androstenone has no anabolic effect

It is difficult to identify pigs that are genetically determined to exhibit low skatole levels because they degrade it faster and also because the environment (feeding, poor health etc) might influence skatole level.

5.3.2. RECOMMENDATIONS

It is necessary to decrease the frequency of genes causing high levels of boar taint.

5.4. ALTERNATIVE METHODS OF CASTRATION

5.4.1. CONCLUSIONS

Late surgical castration is very effective in reducing boar taint but is not practical.

Local destruction of testicular tissue by chemicals, with the methods currently available, should not be used because of possible pain to the animal and continuing risk of boar taint.

Exogenous hormones are effective in inhibiting sexual development. Very little is known on their efficiency for reducing boar taint.

Immunocastration has been proven to be very effective in inhibiting sexual development and reducing boar taint. However, a number of uncertainties are listed below:

- The acceptability of immunocastration by the public is unknown.
- There might be safety concerns for consumers in relation to possible residues in meat.
- There are safety concerns for staff performing immunocastration who might inject themselves.
- Possible welfare problems associated with immunocastration have not been investigated
- The effectiveness of immunocastration has to be checked on an individual basis. (With early immunocastration, the assessment of the effectiveness of the treatment can be easily achieved by measuring testes weight. With late immunocastration, an assessment of boar taint would have to be performed on the slaughter line).

The proportion of animals which do not respond to immunocastration seems to be low, but the exact figure is not known for EU pig populations.

Cryptorchids and intersex pigs have high levels of boar taint.

5.4.2. RECOMMENDATIONS

With the present state of knowledge, local destruction of testicular tissue by chemicals cannot be recommended because of the lack of information on possible pain inflicted to the animals and on the achieved reduction of boar taint.

With the present state of knowledge, immunocastration, cannot presently be recommended, due to a number of concerns, for instance:

- The effectiveness of immunocastration in EU pig populations for reducing boar taint in commercial EU pig populations is not known.

- Immunocastrates should be individually checked on the slaughter line for the absence of boar taint. In this context a possible goal could be to aim at levels of boar taint in immunocastrates which are similar to those presently observed as a result of surgical castration.
- Operator safety
- Resulting welfare should be at least as good as surgical methods

However, if such concerns are addressed, immunocastration may prove to be a valuable tool in European pig farming.

5.5. SEXING OF SPERM AND INSEMINATION METHODS

5.5.1. CONCLUSIONS

In the future, sexing of sperm to produce only female pigs could obviate the need for surgical castration.

5.5.2. RECOMMENDATIONS

No recommendation on the use of sexing of sperm and its insemination methods can be made at present

6. CONTROL OF POST-MORTEM TAIN

6.1. PUBLIC HEALTH ASPECTS OF THE BOAR TAIN COMPONENTS: SKATOLE AND ANDROSTENONE

6.1.1. CONCLUSIONS

There is no evidence of toxicity in humans of androstenone at normal levels of consumption. However, there is evidence that skatole in very high concentrations is toxic in some species. These concentrations are much higher than those likely to be consumed as the result of eating evenly highly tainted boar meat.

6.2. ONLINE DETECTION OF BOAR TAIN IN PORK CARCASSES

6.2.1. CONCLUSIONS

A reliable on-line test for use in abattoirs is needed to remove the possibility of tainted meat products. Sensor array based systems (e-noses) seem to offer the greatest potential and various types are under investigation, however on-line detection is unlikely to be available in the near future.

In the absence of a harmonised detection method, there is evidence that on-line detection methods of pronounced boar taint (as provide for by 64/433/EC, as amended), may vary among Member States.

Boar taint is not considered as a problem in those Member States whose pigs are less than 80Kg carcass weight.

There is no clear scientific basis for the carcass weight of 80kg above which tests for pronounced boar taint should be made.

6.2.2. RECOMMENDATIONS

Tests currently applied to fat from carcasses of entire males should continue to be used. Further development of harmonised on-line tests for use in slaughter houses should be encouraged.

The 80kg carcass weight limit for obligatory detection of taint should be questioned.

6.3. EFFECTS OF MEAT PROCESSING ON THE PERCEPTION OF BOAR TAIN.

6.3.1 CONCLUSIONS

High levels of skatole and androstenone are detected in both processed and fresh pork. Certain processing treatments, such as the use of polyphosphates, curing salts, herbs and spices do not always mask taint. One problem with research in this area is the lack of standardized methods (preparations, taint levels, analytical techniques).

6.3.2 RECOMMENDATIONS.

The current practice of processing carcasses with low level of taint, on the assumption that this will completely mask boar taint, can not be recommended.

FUTURE RESEARCH: HIGH RESEARCH PRIORITIES AND OTHER FUTURE RESEARCH

1. GENERAL

High research priorities

A survey of the extent of castration of male and especially female pigs in the various EU Member States is required. The reasons for such a practice should be clarified.

2. CASTRATION OF PIGLETS

2.1 HISTORY AND EXTENT OF THE CURRENT PRACTICE

High research priorities

A survey of the procedures (including who does it and how [techniques, operators, anaesthesia, age, etc.]) used in the various EU Member States for castrating male and female pigs is needed.

2.2 PHYSIOLOGY AND IDENTIFICATION OF PAIN

High research priorities

Research needs to be carried out into the age-related pain perception mechanisms involved in the tissues damaged during surgical castration, including ways in which to recognise and assess the degree of pain, distress and discomfort, and of the mechanisms controlling pain in neonatal pigs.

2.3 SURGICAL METHODS OF CASTRATION

2.4 HEALTH AND WELFARE IMPLICATIONS OF SURGICAL CASTRATION WITHOUT ANAESTHESIA AND ANALGESIA.

High research priorities

The influence of age at castration on pain perception, hernia incidence, growth check and the immune system needs to be determined.

Information on morbidity and mortality of uncastrated and castrated piglets in commercial herds needs to be collected.

Other future research

More information is needed on the effects of castration on the immune system of fattening pigs and elucidates the underlying mechanisms (e.g. are they due to the pain-stress related reactions and/or to the lack of testicular hormones?).

Determine whether it is less painful and stressful for the piglets to be submitted to husbandry practices separately or simultaneously with castration.

2.5 HEALTH AND WELFARE IMPLICATIONS OF SURGICAL CASTRATION WITH ANAESTHESIA AND ANALGESIA

High research priorities

Measure the advantages and drawbacks of local anaesthesia of large numbers of piglets under commercial conditions including the risk of non-accurate application (frequency, consequences of non-application of the anaesthetic at the desired site etc). Evaluate the cost (labour, products) of such a procedure.

Develop a protocol of long-lasting analgesics and validate it under experimental conditions. Measure the advantages and drawbacks of this protocol on large numbers of piglets under commercial conditions. Evaluate the cost (labour, products) of this protocol.

Other future research

Finalise a protocol of general anaesthesia. Measure the advantages and drawbacks of this protocol on large numbers of piglets in commercial herds including the safety risk for the staff performing it. Evaluate the cost (labour, products) of this protocol.

2.6 CASTRATION OF FEMALE PIGS

High research priorities

To develop and validate painless method(s) of castrating female pigs.

3. PRODUCTION OF ENTIRE MALES

High research priorities

More research on the expression and causation of male sexual behaviour is needed, e.g. to determine if and when mounting behaviour is playfully or sexually motivated, which stimuli from other pigs play a role in eliciting the behaviour and how much stimulation (sex and aggression) is needed to affect fat androstenone levels.

Other future research

Studies are needed on, if, and at which age the increased aggression and sexual behaviour of males becomes a welfare problem

Investigations should be made of whether entire males are more susceptible to stress than castrates.

The current minimal requirement for the housing, of pigs should be reevaluated for the production of entire males

Investigate whether current protocols for transport and pre-slaughter handling are adequate for entire males.

4. BOAR TAIN

High research priorities

Chemical analytical methods used for determination of androstenone and skatole require investigation such that standard methods are agreed upon. A proficiency test/ring trial system needs to be formally developed.

Other future research

The relative contribution of substances to boar taint other than androstenone and skatole needs to be determined

The levels of boar taint compounds that underlie accept/reject criteria used at carcass inspection with respect to boar taint need further experimental investigation.

Sensory evaluation of boar taint should be standardised. There is a need for more refined sensory descriptors to characterise the effects of the compounds causal in boar taint.

Factors influencing anosmia to boar taint in human populations and the relative sensitivities of males/females needs to be investigated for carcasses and processed pork products.

Investigations are necessary to determine if acceptance of meat having boar taint is based on national differences in slaughter weight, breeds used, culinary traditions etc.

5. CONTROL OF TAINT: ANTE MORTEM

5.1 MANAGEMENT

High research priorities

There is a need for further research to clarify stimulating and inhibitive effects on androstenone production e.g. effects of social environment, hierarchy, mixing, relocation and interactions between them, and how such factors can be utilised.

Interactions between husbandry conditions and slaughter weight, as well as breed differences in relation to skatole levels in carcasses should be determined.

5.2 NUTRITION AND DIET

High research priorities

Diets and feed additives for control of skatole production should be evaluated (time period, feed source, concentration, how the additive should be fed etc.) in order to optimise efficiency and minimise cost.

5.3 GENETICS

High research priorities

The genetic relationship between androstenone and skatole metabolism must be established. For example topics may consider if it is a specific inhibiting effect of androstenone on skatole metabolism or if it is a general inhibiting effect of high steroid levels.

Strategies for the optimum use of breeds with low propensity for boar taint compounds in breeding programmes need to be develop

There is a need to identify genetic markers that are specific for androstenone synthesis or metabolism which do not affect the production of sex steroids

There is a need to develop standardized tests for the identification of pigs carrying genes associated with low levels of androstenone and skatole.

Other future research

It is necessary to develop genetic markers for boar taint caused by skatole and androstenone and if possible, for other substances contributing to boar taint.

5.4 ALTERNATIVE METHODS OF CASTRATION

High research priorities

In addition to all legal requirements necessary for registration of a product used for castration, the following considerations are recommended:

Evaluate the welfare impact associated with local chemical destruction of testicular tissue.

Investigate the effectiveness of local chemical destruction of testicular tissue in reducing boar taint.

Investigation of vaccine residues in meat from immunocastrates.

Large scale experimental and on-farm studies should be carried out to investigate the proportion of non-respondents to immunocastration, and the resulting frequency of immunocastrates exhibiting boar taint. The reason for lack of response should be investigated.

Other future research

Investigate the possible welfare problems associated with immunocastration and compare it with other castration methods.

Survey of the frequency of cryptorchids and intersex pigs in EU slaughter pig populations and on boar taint levels in such animals.

5.5 SEXING OF SPERM AND INSEMINATION METHODS

Future research

Develop and evaluate techniques to sort sperm and evaluate delivery techniques taking into account both animal welfare and efficiency of the method.

6. CONTROL OF TAINT: POST MORTEM

6.1 PUBLIC HEALTH ASPECTS OF THE BOAR TAINT COMPONENTS: SKATOLE AND ANDROSTENONE

Future Research

More information on the metabolism of skatole in humans and animals is required so that the possible effects of ingestion of high levels can be determined.

6.2. ONLINE DETECTION OF BOAR TAINT IN PORK CARCASSES

High research priorities

A reliable on-line analytical method for abattoir use to remove tainted carcasses should be developed.

Other future research

Research into electronic-noses and related technologies for on-line detection by providing fingerprints for boar-taint, should be supported.

New studies on threshold values for androstenone and skatole using the various sensory and chemical tests in use are needed. Thresholds could be established based on both the concentrations of skatole and androstenone and the sensory responses to them.

6.3. EFFECTS OF MEAT PROCESSING ON THE PERCEPTION OF BOAR TAINT.

High research priorities

New processing methods for the use of carcasses with different levels of taint should be developed.

DOCUMENTATION PROVIDED TO EFSA

Letter of 6th August 2003 with ref. SANCO E2/RH/gp (03)D/521661r1, and letter of 13th January 2004 ref. SANCO D.5/SO D(2003) 450209 from Mr Checchi Lang from the Health and Consumer Protection Directorate General.

REFERENCES

All references are available in the scientific report on welfare aspects of the castration of piglets.

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