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# Consumer test of meat from entire males, in relation to skatole in backfat.

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## Introduction

In the last 15 years investigations have been carried out in order to be able to slaughter entire males instead of castrates. The problem is that the meat from a small percentage of the entire males gives off a bad smell when heated. The reason for the taint is probably more than one odorous product. 5-α-Androstenone has been recognized as one of the odour components, and some authors have carried out taste panel and consumer tests where the entire males tested have been divided in groups in relation to androstanone content. The conclusion from these tests were that over and above androstenone there must be other compounds contributing to the taint.
Vold (1970) has mentioned thet skatole could be one of the taint products. Walstra et al.(1970) and Hansson et al. (1980) have also worked with skatole as an explanation for boar taint.
As reported at the meat research workers meeting in 1984 (Mortensen and Sørensen, Lundström et al.) we have developed a method for the determination of skatole in backfat. This method has been used for analysing a rather large number of entire males and the results have been compared to laboratory panel judgements of boar taint.
A review of the consumer tests carried out (Malmfors et al., 1983) showed that consumers'attitude to meat from entire males varied in different tests. This variation can be due to different experimental set ups or that some groups might be more sensitive or critical to unpleasant odours than others.
In the presen experiment we have carried out a consumer test in order to establish consumer reactions to meat from entire males when entire males with a high skatole content i.e. ≥ 0.25 ppm were eliminated. The reason for having this limit was that in an earlier smaller (unpublished) consumer test we used entire males with skatole up to .35 ppm skatole. We received many adverse comments from consumers who had received meat from entire males with skatole above .25 ppm.

## Materials and methods

### Chemical analysis

Skatole determination was carried out according to the method described by Mortensen and Sørensen (1984). The method has been transferred from Technicon autoanalyzer to an analytical system where 150 samples per hour can be analysed.

### Sampling of meat

The pigs for the consumer test came from eight different farmers, who supplied a total of 1,000 entire males. From this material meat from 139 entire males and 139 castrates was chosen. From each animal a loin cut and a belly cut was used. One day after slaughter the cuts were vacuumpacked and aged at 2°C until 7 days after slaughter and then frozen until distribution to the consumers.
The entire males were selected after skatole content in the backfat.

The distribution is shown below.

| ppm skatole | <=.14 | .15 | .16 | .17 | .18 | .19 | .20 | .21 | >=.22 |
|---|---|---|---|---|---|---|---|---|---|
| number of entire males | 45 | 12 | 12 | 12 | 13 | 11 | 11 | 10 | 13 |

The castrates used as controls were from the same farmers as the entire males. We intended to have the same number of entire males and castrates from each farmer, but that was not possible. We analysed the castrates for skatole and we had the following distribution :

| ppm skatole | <=.14 | .15 | .16 | .17 | .18 | .19 | .20 | .21 | >=.22 |
|---|---|---|---|---|---|---|---|---|---|
| number of entire males | 110 | 8 | 12 | 2 | 3 | 1 | 1 | 1 | 1 |

The pigs sent for consumer test were in the weight range 65-75 kg carcass weight and with a meat percent (KSA-measurement) 53-60%.

### Consumers

Before the selection of the households they were all asked whether they used pork fairly regularly. Only households that used pork regularly participated.
The consumers were from 278 households randomly selected throughout the country. The age varied from 8 to 80 years.
None of the consumers were informed that they might be testing meat from entire males.
The consumers all got a coded sample from an entire male and from a castrate. They got either loins or bellies. They were asked to prepare both samples in the same way (as they used to prepare this cut) but on two different days. We asked them to use the sample from the castrate first.
We asked the consumers the following questions :

#### Preparing

1 : If you were present when the meal was prepared : Do you have any comments, if yes what are your comments?

#### Eating

2 : Do you find anything specially good, and if you do, what are your comments?

3 : Do you find anything specially bad, and if you do what are your comments?

#### Comparing

4 : When you compare this pork with the pork you normally get : Do you then find it 1) Much better, 2) Slightly better, 3) Same, 4) Slightly worse , 5) Much worse?

Results.

In this consumer test we received answers from 269 households (830 consumers), 425 answers for 136 loin cuts and 405 answers for 133 belly cuts.
The most important answers from a consumer test are the reactions from the cooks and the judgement of the over-all impression of the meat.
The answers from the cooks were divided into different groups as shown in Table 1.

Table 1 : Comments from the persons who were present at cooking. The figures are given as a percentage of the persons present

| | Loin cut | | Belly cut | |
|---|---|---|---|---|
| | Castrate | Entire male | Castrate | Entire male |
| Number of persons present at cooking | 218 | 203 | 196 | 192 |
| No comments | 88.5 | 83.3 | 87.8 | 85.4 |
| Good odour | 1.8 | 1.5 | 2.6 | 2.1 |
| Boar taint | | 1.0 | 0.5 | 0.5 |
| Other smells | 0.5 | 4.9 | 0.5 | 5.7 |
| Big cooking loss | 3.2 | 1.0 | 6.1 | 4.7 |
| Small cooking loss | 5.0 | 4.4 | 1.5 | 2.1 |
| Rind is hard | | 3.0 | | |

This jugdement showed a little more comment on "boar taint and other smells" for entire males than for castrates : about 6% against 0.5% to 1.0%.
For the loint cut the difference was significant ($p<0.05$), for the belly cut it was not significant.
The over-all impression from all consumers compared to what they normally eat is shown in Table 2.

Table 2 : Over-all impression of the meat. The figures are given as a percentage of the consumers

| | Loin cut | | Belly cut | |
|---|---|---|---|---|
| | Castrate | Entire male | Castrate | Entire male |
| Number of consumers | 425 | 425 | 405 | 405 |
| Much better | 13.3 | 9.5 | 9.9 | 7.2 |
| Slightly better | 36.5 | 33.2 | 27.5 | 19.1 |
| Same | 37.9 | 39.6 | 34.9 | 45.0 |
| Slightly worse | 10.0 | 15.2 | 23.3 | 21.3 |
| Much worse | 2.4 | 2.6 | 4.5 | 7.4 |

For the loin cut there was no significant difference between entire males and castrates even though there was a tendency for the castrate to be a little better. For the belly cut there was a small significant difference ($p<0.01$), the castrates being the best.
The comments from eating the meat were divided into two groups, positive and negative as shown in Table 3.

Table 3 : Positive and negative comments when eating the meat. The figures are given as a percentage of the consumers

| | Loin cut | | Belly cut | |
|---|---|---|---|---|
| | Castrate | Entire male | Castrate | Entire male |
| Number of animals | 136 | 136 | 133 | 133 |
| Number of consumers | 425 | 425 | 405 | 405 |
| Positive comments: | | | | |
| None | 42.8 | 55.1 | 57.8 | 65.2 |
| Good taste | 23.8 | 18.4 | 18.0 | 17.5 |
| Tender meat | 8.9 | 10.1 | 2.7 | 2.0 |
| Juicy meat | 15.3 | 10.8 | 4.4 | 1.7 |
| Lean meat | 4.9 | 4.9 | 4.0 | 2.2 |
| Good rind | 12.5 | 7.1 | 12.6 | 7.7 |
| Other comments | 16.0 | 11.1 | 10.9 | 6.9 |
| Negative comments: | | | | |
| None | 65.6 | 60.5 | 60.0 | 59.8 |
| Without taste | 2.8 | 3.3 | 1.8 | 3.5 |
| Undefined taste | 2.1 | 3.8 | 3.2 | 1.5 |
| Tough meat | 0.5 | 1.2 | 1.5 | 1.0 |
| Too fat | 20.2 | 15.5 | 32.3 | 29.1 |
| Too dry | 6.6 | 8.0 | 3.2 | 0.7 |
| Bad rind | 0.7 | 3.8 | 2.2 | 3.2 |
| Other comments | 5.4 | 6.4 | 3.2 | 5.6 |

These results only showed small differences between entire males and castrates.
Looking at the over-all impression for pigs from different herds the results showed that for 6 herds there was no significant difference between entire males and castrates. For the 7th herd no castrates were delivered. For the 8th herd there was a significant difference between entire males and castrates ($p<0.01$), the castrates being best.
With the intention of illustrating the difference in judgement of meat from different herds, those with the biggest differences between entire males and castrates are shown in Table 4.
It seems that from some herds the consumers prefer meat from entire males and from other herds they prefer meat from castrates.

Table 4 : Comparison of over-all impression of meat from pigs from different herds

| | Loin cut | | | |
|---|---|---|---|---|
| | Herd number 4 | | Herd number 5 | |
| | Castrate | Entire male | Castrate | Entire male |
| Number of consumers | 70 | 61 | 52 | 42 |
| Much better | 20.0 | 6.6 | 9.6 | 11.9 |
| Slightly better | 28.6 | 21.3 | 30.8 | 35.7 |
| Same | 42.9 | 42.6 | 32.7 | 45.2 |
| Slightly worse | 8.6 | 21.3 | 15.4 | 7.2 |
| Much worse | 0.0 | 8.2 | 11.5 | 0.0 |
| | Belly cut | | | |
| | Herd number 4 | | Herd number 1 | |
| | Castrate | Entire male | Castrate | Entire male |
| Number of consumers | 69 | 58 | 80 | 50 |
| Much better | 24.6 | 3.4 | 5.0 | 18.0 |
| Slightly better | 31.9 | 25.9 | 17.5 | 16.0 |
| Same | 30.4 | 48.3 | 42.5 | 46.0 |
| Slightly worse | 11.6 | 12.1 | 25.0 | 18.0 |
| Much worse | 1.4 | 10.3 | 10.0 | 2.0 |

## Discussion

With the analytical method for skatole we have analysed 13,000 entire males over a period of 3 years. The entire males have been produced in order to test the analytical system and with the intention to see how big a percentage of the entire males that should be sorted out at different skatole limits. The distribution of the enitire males are shown in Table 5.

Table 5 : Distribution of entire males according to skatole content

| ppm skatole | 0-0.14 | .15-.19 | .20-.24 | >=.25 |
|---|---|---|---|---|
| % of entire males | 76.2 | 14.8 | 6.2 | 5.1 |

One of the reasons for carrying out this consumer test was to see whether the limit should be 0.20 ppm or 0.25 ppm. When we look at the results from this consumer test in relation to skatole content in backfat we see no tendency to more negative comments for entire males with skatole above 0.20 ppm than below.

Because of the shortage of entire males in the group between 0.20 and 0.25 ppm skatole, we must repeat the test with more pigs in this group.
When we compare the results from this consumer test with consumer tests made earlier we should only compare with those where the meat from the entire males in some way has been sorted into groups for taint.

| Percent of consumers rating the odour of the meat as unpleasant | | | | | | | |
|---|---|---|---|---|---|---|---|
| Reference | Preclassification | Controls | | Entire males | | Cut |
| Present experiment | Skatole in entire male <.25 ppm | .5<br>1.0 | | 5.9<br>6.2 | | Pork loin<br>Pork belly |
| Desmoulin et al., 1982 | Androstenone <1.0 ppm | 6 | | 34 | | Roasts and cutlets |
| Lundstrøm et al., 1983 | Panel: no taint<br>Cooks (Tasters) | 9<br>5 | (6)<br>(3) | 19<br>20 | (10)<br>(18) | Cutlets<br>Sliced belly |
| Percent of consumers rating the taste of the meat as unpleasant | | | | | | | |
| Reference | Preclassification | Controls | | Entire males | | Cut |
| Present experiment | Skatole in entire male <.25 ppm | 2.1<br>3.2 | | 3.8<br>1.5 | | Pork loin<br>Pork belly |
| Desmoulin et al., 1982 | Androstenone <1.0 ppm | 12 | | 21 | | Roasts and cutlets |
| Lundstrøm et al., 1983 | Panel: no taint<br>Cooks (Tasters) | 8<br>4 | (11)<br>(5) | 7<br>13 | (8)<br>(9) | Cutlets<br>Sliced belly |
| Number of samples and consumers in the experiments | | | | | | | |
| Reference | No of samples | | No of cooks | No of tasters | | Cut |
| Present experiment | 136<br>133 | | 218<br>203 | 425<br>405 | | Pork loin<br>Pork belly |
| Desmoulin et al., 1982 | 55<br>66 | | | 86<br>124 | | Boars<br>Controls |
| Lundstrøm et al., 1983 | ?<br>?<br>? | Entire<br>males<br>Controls | 54<br>54<br>58<br>55 | 79<br>61<br>102<br>76 | | Sliced belly<br>Cutlet<br>Sliced belly<br>Cutlet |

In the present experiment we can see that the comments we have got from our consumers are very few compared to the comments in the other experiments both for entire males and castrates. We can of course not explain the reason for the difference in comments to the castrates, and it makes a proper comparison difficult.
Concerning the cooking odour we received a similar number of adverse comments for entire males compared to castrates as the work reported by Lündtrøm, for the "no taint" group established by a taste panel. Compared with the results reported by Desmoulin the comments we have got in the present experiment seems to be less.
Concerning the taste, the present experiment showed that there is no difference in the comments of bad taste between entire males and castrates. This is definitely better than reported by Desmoulin, who found a difference in taste between entire males and castrates.
In conclusion there are only few adverse comments on meat from entire males compared to castrates, when the entires are selected so that only those with a low content of skatole are sent to consumers. It seems that an analysis for skatole is as good as a judgement that made by a trained panel.

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