Expected effects on carcass and pork quality when surgical castration is omitted: results of a meta-analysis study

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Introduction

• Alternatives to surgical castration
  • Castration under anaesthesia = castrate (C)
  • Immunocastration (IC)
  • Entire males (EM)

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Materials and methods

In the database results of 26 published (>1990 up to 2009) and 2 unpublished studies included:

- Carcass characteristics
- Meat quality

EM = control
C
Female pigs (F)
IC

In the study results (means) from:

- EM; n = 2683
- C; n = 3427
- F; n = 3736
- IC; n = 96

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Materials and Methods

Results of 9 traits were collected

- **Lean meat, %**
- **Intramuscular fat, %** - longissimus muscle
- **Initial pH** - 30, 45 and 60 min post mortem in the LM
- **Ultimate pH** - 18, 24 or 48 h post mortem in the LM
- **L*** - lightness of the LD
- **Drip loss, %** - purge formed during storage at 4°C for 24, 48 or 72 h
- **Shear force, kg** - maximum shear force
- **SFA, %** - saturated fatty acid level in the adipose tissue
- **MUFA, %** - monounsaturated fatty acid level in the adipose tissue
- **PUFA, %** - polyunsaturated fatty acid level in the adipose tissue
- **Tenderness score** - evaluated on a scale from 0 (though) to 10 (tender)
- **Sensory juiciness** - evaluated on a scale from 0 (though) to 10 (tender)
Statistical Meta-analysis

Original data
Means
SEM, SED, LSD

Database for meta analysis
Means
pooled SE

Empirical effect size

\[
\begin{align*}
\text{Empirical effect size} &= \text{IC}_{\text{Mean}} - \frac{\text{EM}_{\text{Mean}}}{\text{pooled SE}} \\
&= \text{C}_{\text{mean}} - \frac{\text{EM}_{\text{Mean}}}{\text{pooled SE}} \\
&= \text{F}_{\text{mean}} - \frac{\text{EM}_{\text{Mean}}}{\text{pooled SE}}
\end{align*}
\]

Empirical effect sizes & estimated parameters of the model are dimensionless quantities

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Statistical Meta-analysis

• Data analysis carried out as multiple treatment studies (Gleser and Olkin, 1994)
  • Linear model accounts for correlation of effect sizes as introduced by a common control group (EM)

• Generalized least squares procedure were used to calculate

**Model parameters** $\beta_C$, $\beta_{IC}$ and $\beta_F$ = estimates of the of population effect sizes for C, IC, and F, respectively.

**Estimates of mean differences**

$D_{C-EM} = C_{\text{mean}} - EM_{\text{Mean}}$

$D_{IC-EM} = IC_{\text{Mean}} - EM_{\text{Mean}}$

$D_{F-EM} = F_{\text{mean}} - EM_{\text{Mean}}$
Results

Carcass Characteristics

Lean meat percentage

Estimated effect size

-0.8
-0.4
0.0
0.4
0.8
1.2
1.6

Intramuscular fat content

Estimated effect size

-1.6
-1.2
-0.8
-0.4
0.0
0.4
0.8
1.2
1.6

* 2.69%
* -1.77%
* -0.42%

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Results

FATTY ACID COMPOSITION

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Conclusions

Raising EM instead of castrates, immunocastrates or female pigs may result:

• Leaner cracsses

• Lower intramuscular fat content

• Adipose tissue has a higher degree of unsatuation
  • Higher SFA and lower PUFA content

• Greater shear force values
  • no apparent effect on tenderness scores
Thank you for your attention