

Characterisation of adipose tissue in immunocastrated pigs

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Welfare (and economical) concerns about surgical castration without anesthesia/analgesia

Possible alternatives

Anesthesia/analgesia, etc.

Rearing entire males

Immunocastration

Surgical castration

- boar taint,
- inferior fat quality,
- aggressive
- /+lower fat accretion,
- +more efficient performance

- Until the 2nd vaccination, IC are similar than EM;**
After 2nd vaccination:
- lower aggressiveness
 - less efficient performance
 - /+ fat accretion
 - /+quick growth

- no boar taint,
- +better fat quality,
- /+higher fat accretion,
- +less efficient performance
- +less aggressive

Objective of the study

The objective of the study was to evaluate the **effect of immunocastration on fat accretion** from morphological, histomorphological and biochemical perspective by comparing **immunocastrated pigs (IC)** with **entire male (EM)** and **surgically castrated (SC)** pigs.

Introduction
Methods
Results
Conclusion

Animals:

- 36 pigs, Landrace x Pietrain crossbreed
- 12 EM, 12 IC, 12 SC
 - Vaccination with Improvac[®] at the age of 12 and 21 weeks
- Slaughtered at the age of 26 weeks, and live weight 121.7 ± 1.6 kg.

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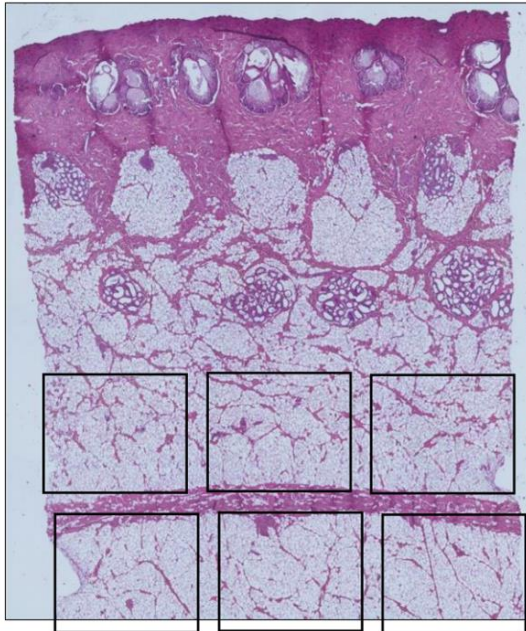
Measurements:

- Backfat thickness at the level of the last rib (mm), on withers (mm) and above *Gluteus medius* muscle (mm)
- Belly lean meat (%)
- Ratio between fat and meat area



Sampling of the inner and outer back fat layer on withers. Determination of:

- **Histomorphological analysis:**



- Backfat on withers was dissected, fixed, embedded in paraffin and sectioned.
- Sections were stained with hematoxylin and eosin.
- Digital images were acquired with light microscope.
- Image J program was used for determination of:

- dermis thickness (μm),
- number of adipocytes per fascicle,
- fascicle surface area (μm^2),
- adipocyte surface area (μm^2).

Six randomly chosen fields (3 in inner and 3 in outer layer) exhibiting the best membrane integrity were used for cellularity analysis on each slide.

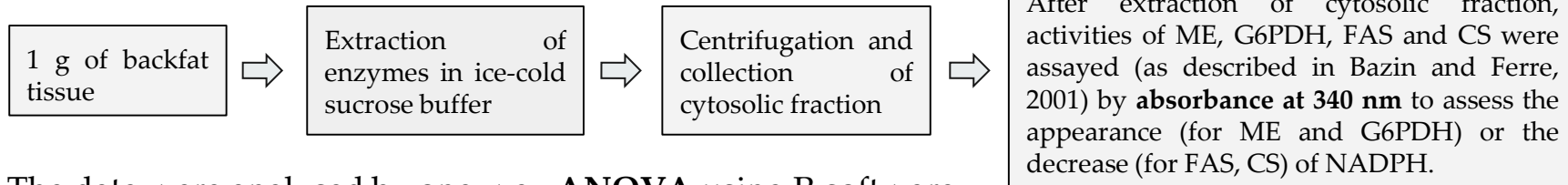
Sampling of the inner and outer back fat layer on withers. Determination of:

- **Fatty acid composition** of inner back fat layer using gas chromatography.

Fatty acids were extracted and trans-methylated as described in Park and Goins, 1994; fatty acid methyl esters were identified with Hewlett Packard 6890 FID System. Results are expressed as percentage of total FA.

- **Lipogenic enzyme activities** (in nmol/min per g of tissue) determined in aliquots of inner backfat layer:

- fatty acid synthase activity (FAS),
- malic enzyme activity (ME),
- glucose-6-phosphate dehydrogenase activity (G6PDH),
- citrate synthase activity (CS).



The data were analysed by one-way **ANOVA** using R software.

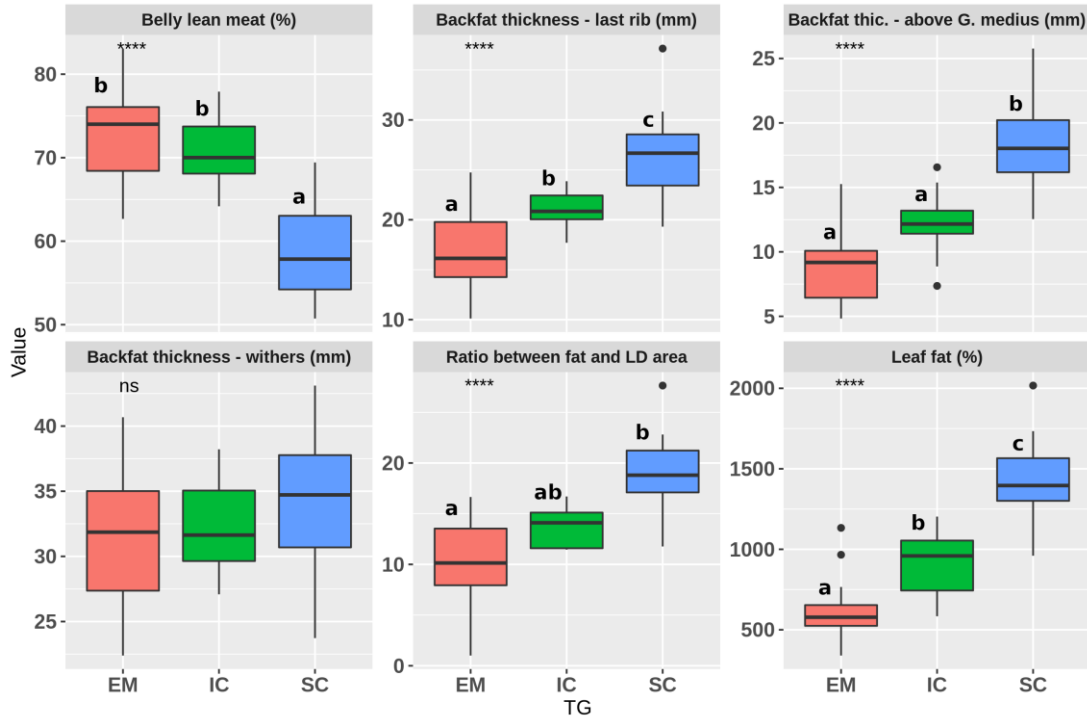
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Results

Conclusion

CARCASS TRAITS of EM, IC and SC

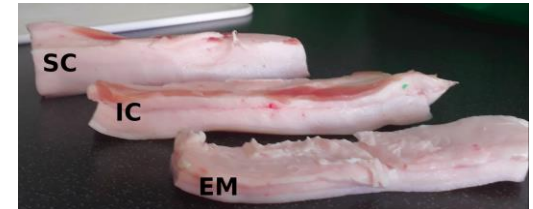


IC compared to EM exhibited:

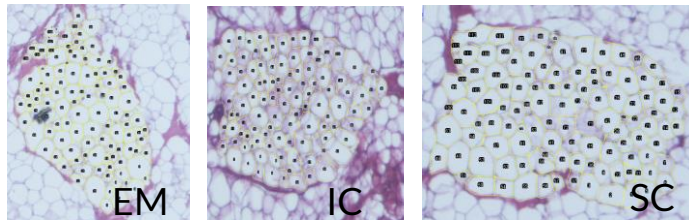
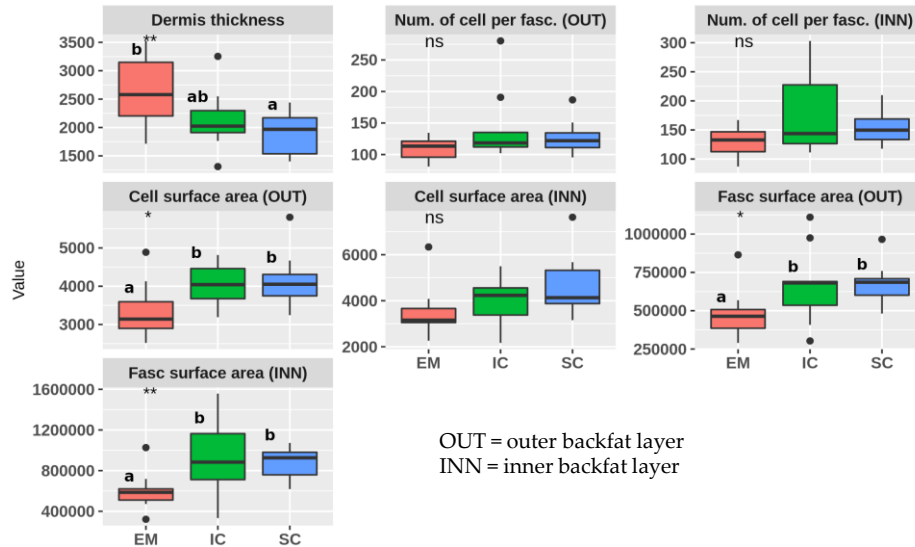
- ↑ values for backfat thicknesses at the level of the last rib,
- ↑ leaf fat percentage.

IC compared to SC exhibited:

- ↑ belly lean meat percentage,
- ↓ backfat thicknesses at the level of the last rib and above *Gluteus medius*,
- ↓ leaf fat percentage.



HISTOMORPHOLOGICAL ANALYSIS of BACKFAT



IC compared to EM:

- Increased adipocyte surface area in outer backfat layer.
- Increased fascicle surface area in outer and inner backfat layer.
- Tendency ($p=0.0501$) of increased adipocyte proliferation in inner backfat layer.

EM compared to SC:

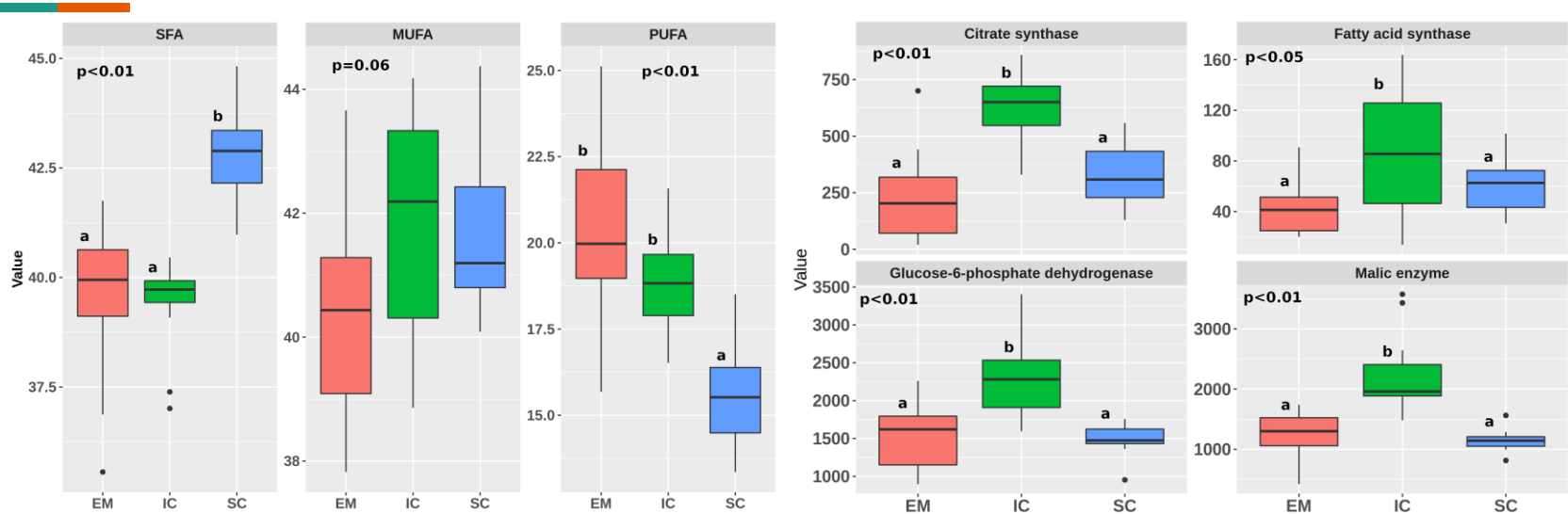
- tendency ($p=0.0537$) of decreased adipocyte surface area in inner backfat layer.
- exhibited thicker dermis.



Probably higher collagen content in EM

Results

FATTY ACID COMPOSITION and LIPOGENIC ENZYME ACTIVITIES



IC exhibited:

- ↓ SFA content (especially **palmitic** and **stearic** acid) and ↑ PUFA content (especially **linoleic** acid) compared to SC.
- Immunocastration caused varied response of animals in MUFA deposition!

IC have:

- 1.4 to 2.7-fold ↑ lipogenic enzyme activities than EM and SC.

*Enzyme activities are in nmol/min per g of tissue

Compared to EM, **immunocastration** caused:

On carcass level:

- enlargement of adipose tissue (leaf fat percentage, backfat thicknesses at the level of the last rib).

On the cellular level:

- expansion of adipocytes in outer back fat layer, as well as expansion of fascicle surface area in outer and inner back fat layer,
- tendency for adipocyte proliferation in inner back fat layer,
- outer backfat layer compared to inner seems to be more responsive to immunocastration.

On biochemical level:

- lipogenic enzyme activity was $\uparrow \Rightarrow$ showing the change in lipid metabolism (\uparrow fatty acid synthesis),
- SFA and PUFA content in backfat of IC was similar than in EM. IC animals had different response to immunocastration (high variability, tendency to elevated MUFA content).

Compared to SC, IC exhibited:

On carcass level:

- ↓ smaller backfat thickness and leaf fat percentage.

On biochemical level:

- ↑ lipogenic enzyme activities,
- ↓ SFA and ↑ PUFA content.

EM compared to SC exhibited:

- thicker dermis (probably ↑ collagen content).

Thank you for your attention!

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