EFFECT OF SURGICAL OR IMMUNOCASTRATION ON POSTPRANDIAL NUTRIENT PROFILES IN MALE PIGS*

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CONTEXT OF THE STUDY

- Alternatives to early surgical castration of male pigs: rearing entire males and immunocastration

- Advantages of rearing entire and immunocastrated male pigs
  - Higher feed efficiency
  - Fat deposition and muscle deposition

- Metabolic mechanisms underlying the difference in feed efficiency have been slightly investigated
OBJECTIVES

Hypothesis: Better feed efficiency in entire males may be explained by different postprandial nutrient utilisation.

Strategy: Comparison of postprandial nutrient kinetics in unchallenged and fed entire males (EM), castrated males (CM), and immuno-castrated males (IC).
MATERIALS AND METHODS (1)

- 18 males Piétrain x (Large White x Landrace) fed ad libitum (except for meal tests): 3 experimental groups
- Standard growing feed: CP 16.5%, NE 9670 kJ/kg, Lys dig 8.4%
- Housed in individual pen

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<tr>
<th>Weeks</th>
<th>13</th>
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**Early Surgical castration**

**EM**

**CM**
MATERIALS AND METHODS (1)

- 18 males Piétrain x (Large White x Landrace) fed ad libitum (except for meal tests) : 6 experimental groups
- Standard growing feed : CP 16.5%, NE 9670 kJ/kg, Lys dig 8.4%
- Housed in individual pen

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**Immunocastration**
Improvac© Pfizer

- Early Surgical castration
- 3 postprandial kinetics
- Jugular catheter
MATERIALS AND METHODS (2)

- Body weight and feed intake: weekly recorded

- Blood sampling: once a week for plasma testosterone measurement
MATERIALS AND METHODS (3)

- Postprandial kinetics:
  - before immunocastration (16 wks) ≈ 63 kg BW
  - the week following the 2\textsuperscript{nd} injection of Improvac (18 wks) ≈ 79 kg BW
  - 2 to 3 wks after the 2\textsuperscript{nd} injection of Improvac (20 wks) ≈ 87 kg BW

Pigs fasted overnight

- 400 g of feed

Serial blood sampling:

- Glucose, urea, AA...

204 min 210 180 150 120 105 90 75 60 50 40 30 20 10 - 10
DATA ANALYSIS

- Nutrient kinetics: ANOVA on repeated measures (PROC MIXED, SAS)
  Effects of Time (after the meal), Period, Sex, and corresponding interactions

- AA: modeling of individual profiles using a 1-compartment model with an Erlang distribution of residence times (PROC NLIN, SAS)

C0: initial concentration
Cmax: maximum concentration
Mtt: mean residence time or average time a nutrient/metabolite spends in the compartment (derived from AUC)

\[ C(t) = \frac{\Gamma(n-1)}{\Gamma(n)} k^n t^{(n-1)} \exp(-k t) + C_0 \]
Glucose kinetics

To summarize:
- Faster glucose clearance in IC and CM pigs
Glucose kinetics

To summarize:

- Faster glucose clearance in IC and CM pigs
- IC pigs did not differ from CM from the kinetic 2
To summarize:

- Lower urea in IC and EM pigs
Urea kinetics

To summarize:
- Lower urea in IC and EM pigs
- IC did not differ from EM pigs
Lysine kinetics

Modelised curves match well with the average measured concentrations
Lysine kinetics

To summarize:

• Greater lysine concentrations (C0 and Cmax) in CM pigs
Lysine kinetics

To summarize:

• Greater lysine concentrations (C0 and Cmax) in CM pigs
• IC did not differ from EM pigs
Other Essential AA (kinetic 3)

To summarize:
- All essential AA are in greater concentrations in CM pigs
- IC did not differ from EM pigs, but Thr (Cmax) and Met (C0)
Non essential AA (kinetic 3)

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<td>IC = EM = CM</td>
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To summarize:
• IC did not differ from EM pigs
To summarize:

• Greater hydroxyproline concentrations in EM pigs
• IC differed from CM pigs
Conclusions

- When pair fed, compared to castrated males, entire males had:
  - Lower glucose clearance
  - Less urea
  - Faster clearance of essential AA
  - Accumulation of hydroxyproline: greater muscular and collagen mass

- **Immunocastration** influenced rapidly glucose metabolism

- **Immunocastrated** pigs seem to keep a nitrogen metabolism similar to that of entire males during the experimental period

- Fat deposition?

- Protein anabolism?
A special thank to all contributors: Nathalie Bonhomme, Sophie Daré, Nadine Mézière, Christine Treffeux, Alain Chauvin, Josselin Delamarre, Mathieu Gloaguen, Régis Janvier, Michel Lefèbvre, Francis Legouëvec, Patrice Roger.