

Variation in body composition is associated with insulin sensitivity in growing-finishing pigs

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Introduction

- Large variation on body composition is observed in pigs fed and raised in similar *ad-libitum* conditions
- Insulin is commonly viewed as a positive regulator of fatty acid and protein synthesis (Benoit et al., 2004)
- Differences on insulin sensitivity might be associated with variation on body composition

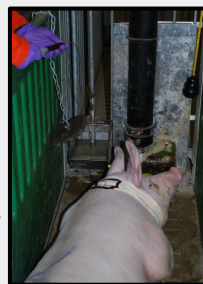
Objective

To elucidate the relationship between insulin sensitivity and body composition in growing-finishing pigs

Material and methods

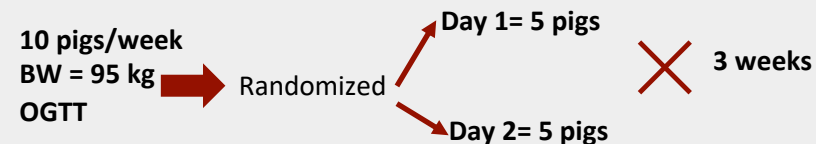
- 30- jugular vein catheterized pigs; BW: 95 ± 3.4 kg
- Same commercial diet

Body composition by dual X-ray densitometry



Oral glucose tolerance test (OGTT)

- 1.75 g of glucose/kg BW
- **Blood samples:** -20, -10, 5, 10, 15, 20, 25, 30, 45, 60, 90, 120, 150, 180, 210, 240, 300 and 360 min following glucose ingestion



Insulin sensitivity indices

1. Homeostasis Model Assessment (HOMA2):

- IR:** insulin resistance
- %S:** insulin sensitivity
- %B:** steady-state beta cell function

2. Whole body insulin sensitivity index

ISI: 0-120 min of OGTT (Matsuda et al., 1999)

3. Insulin-area under the curve (AUC)

Insulin-AUC: 5-360 min after glucose intake

Body composition variables

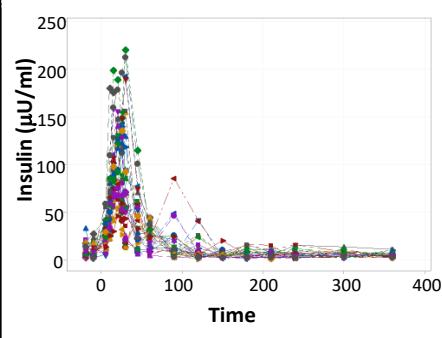
1. Total body fat (%)
2. Total body protein (%)

Statistical analysis:

- Correlations
- Partial least squares (PLS)

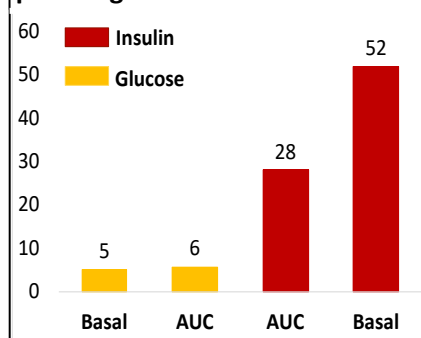
Results and discussion

Individual plasma insulin during OGTT

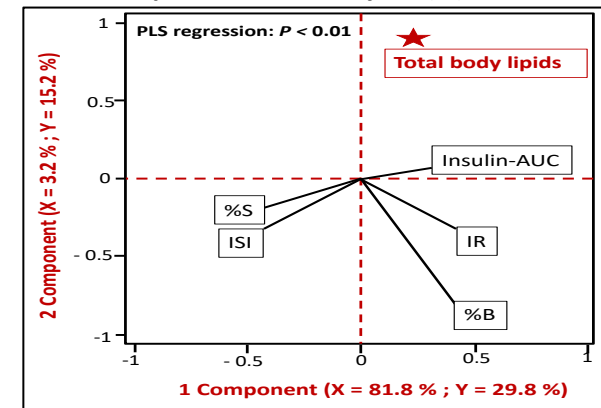


The larger variation of plasma insulin (basal and AUC) compared with plasma glucose might indicate an early stage of insulin resistance for some pigs

Coefficient of variation (%) on plasma glucose and insulin



Partial least square of total body fat (%) vs. Insulin sensitivity indices



X = Total Variance
Y = Total body fat variance

- Fatter pigs were associated with low insulin sensitivity ($r = -0.6$; $P < 0.05$) and insulin resistance ($r = 0.5$; $P < 0.05$)
- Lower insulin sensitivity was associated with higher insulin-AUC ($r = -0.8$; $P < 0.001$)
- *Infusions on insulin resulted on 51-65 % increased of de novo lipogenesis in pigs (Dunshea et al., 1992)*
- Insulin indices accounted for 45% and 40% of the observed variation for total body fat (%) and protein (%), respectively

Conclusions

- Insulin sensitivity and concentrations were highly variable among pigs presenting large CV (>30%)
- Lower insulin sensitivity was associated with higher body fat (%) in growing pigs
- Those results show a potential of using insulin sensitivity to manipulate body composition in growing pigs

References

Benoit, S, et al., 2004. Recent progress in hormones research 59:267-286; Dunshea, F. et al., 1992. Journal of Animal Science 70(1):141-151; Matsuda, M. et al., 1999. Diabetes Care 22: 1462-1470.