EFFECTS OF DIETARY METHIONINE DEFICIENCY ON ADIPOSE TISSUE GROWTH AND OXIDATIVE STATUS IN PIGLETS

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INTRODUCTION

Why Methionine?

The use of **synthetic amino acids** is an important part of pig nutrition.

Formulating diet with synthetic **Met** improves feed efficiency.

**Met** is the second limiting AA for growth in pigs.

A **Met** deficiency decreases the muscular development (Conde-Aguilera et al., 2010).

Consequences on adipose tissue development need to be further explored.

In aging rats, Met deficiency limits growth of adipose tissue (Malloy et al., 2006).

Preliminary experiments show an increase in adipose tissue mass in growing piglets.
Plays a crucial role in energy balance

Excessive fat deposition may be linked to systemic oxidative stress

**Met** is a precursor of Cysteine, one of the three AA of the main cell antioxidant glutathione (GSH)
OBJECTIVE

To determine the mechanisms associated with adipose tissue growth in piglets in response to a dietary Met deficiency and to clarify the consequences on the redox metabolism.
EXPERIMENTAL DESIGN

Perirenal adipose tissue (PRAT)
Dorsal subcutaneous adipose tissue (SCAT)
Muscle (longissimus LD)

9 kg BW

10 days

REST n = 6
Methionine: 0.24%

CTRL n = 6
Methionine: 0.47%

Crude proteins: 18.1%
Fat: 2.4%
Net energy: 9.95 MJ/kg

Feed intake was imposed at the same level in both groups (380 g feed/d)
RESULTS

Perirenal fat proportion in the body tended to be greater

Lipid content into subcutaneous fat was greater in Met deficient piglets
Activities of lipogenic enzymes were greater in adipose tissues of Met deficient piglets.
Lipid accumulation in REST piglets was associated with simultaneous increases in gene expressions related to lipogenesis and lipolysis.
Ectopic lipid accumulation?

Lipid accumulation in skeletal muscle was associated with an increase in lipogenesis and an increased uptake (??) of circulating FFA.
ANTI-OXIDANT SUPEROXIDE DISMUTASE (SOD)

SOD responsible for destroying superoxide radicals had greater activity in adipose tissues of Met deficient piglets.
Catalase responsible for the decomposition of hydrogen peroxides had greater activity in adipose tissues of Met deficient piglets
The oxidized form of the glutathione (GSSG) had a greater abundance in adipose tissues of Met deficient piglets.
CONCLUSIONS

- Dietary Met restriction modifies the partition of energy towards lipid accumulation in adipose tissues and skeletal muscle.

- Dietary Met restriction promotes the conversion of glucose to lipids (lipogenesis) but also lipolysis, which might result in ectopic (muscle) fat accumulation.

- The antioxidant capacity in adipose tissues is increased in Met deficient piglets, likely to cope with more oxidative stress.

- Altogether, both adipose tissue metabolism and redox status of piglets are modulated by dietary Methionine supply during growth.
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THANK YOU FOR YOUR ATTENTION
ANTI-OXIDANT TOTAL CAPACITIES IN PLASMA

FRAP

\[ P < 0.001 \]

DPPH

\[ P < 0.05 \]

ABTS