Modification of piglet behavior and welfare by dietary antibiotic alternatives

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Introduction

- Pigs are subject to stress at various timepoints of production

**Stressors**

**Weaning**
- Sow separation
- Mixing
- Diet change

**Transport**
- Dehydration
- Feed restriction
- Temperature extremes

→ Emotional distress
↑ Pathogen exposure
↓ Intestinal health
↓ Energy intake

Performance + Welfare issues

(Chiba, 2010; Smith et. al., 2010; Campbell et al., 2013)
Common practices to solve negative impact of stress:

- **Focused on performance**
- Often based on dietary *antibiotic* use - prophylactically

Societal demand for a **decrease in antibiotic use**

Antibiotic alternatives:

- Bacteriophages, **Probiotics, Prebiotics**, Organic acids, Plant extracts, Essential oils, Lysozymes, **Amino acids**
Objectives

- **Study 1**: Evaluate the effects of no antibiotic (NA), L-glutamine (GLN) or antibiotic (A) supplementation after weaning and a transport stress on short and long-term welfare indicators and behaviors.

- **Study 2**: Evaluate the effects of synbiotic (SYN) supplementation before and after weaning on cognition.

- **Both**: Evaluate the effects of supplementation on gastro-intestinal microbial populations.
Study 1: Materials & Methods

240 (Yorkshire × Landrace × Duroc) From 32 litters, Groups of 8

Weaning
Age: 18 ± 4.2 days
Weight: 5.4± 1.4 kg
+ 12h-Transport

0 14 Slaughter

3 diets 1 diet: antibiotic free, corn + soybeans

1. A – Antibiotic diet: Chlortetracycline (0.40g/kg) + Tiamulin (0.035g/kg)
2. NA – Control diet: without any antibiotic or feed supplement
3. GLN – L-glutamine diet: 0.20% L-glutamine
Study 1: Materials & Methods

**TS** – Tear staining (indicator of stress)

**SL** – Skin lesions (indicator of aggression)

**NOT** – Novel object test in home pen

- **Avoidance**
- **Showing interest**
- **Interacting**
Study 2: Materials & Methods

From 1 to 28 days of age, individual feed supplementation by oral dosing:

1. SYN - Synbiotic supplement: a probiotic (*Lactobacillus*) + a prebiotic (fructo-oligosaccharide) + *Saccharomyces cerevisiae* cell wall

2. CTL - Control supplement: chocolate milk

Object Recognition test

Barrier Solving test

Weaning (age 18.1 ±1.8 d, weight 13.8 ±2.4kg)

Acquisition

Reversal

T-maze test

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Larger stain areas for NA pigs = Long-term effects of a short diet treatment

NA pigs more stressed

GLN pigs similar to A pigs
Study 1: Results & Discussion

Skin Lesions

**Number of lesions**

Effects only on Day 2 = the establishment of the hierarchy post-mixing

**NA** pigs had more lesions than **A** and **GLN** pigs
→ More aggression

**GLN** pigs similar to **A** pigs

** p<0.01
Study 1: Results & Discussion

Novel Object Tests

Short and long-term effects of a short diet treatment

NA pigs less interested by the object → less avoiding but less time exploring + slower to interact

# p<0.1     * p<0.05     **p<0.01
Study 2: Results & Discussion

T-maze Test

Number of correct choices

- **SYN** piglets interacted quicker with the novel object in the OR Test - **EPISODIC-LIKE MEMORY**
- **SYN** piglets had shorter distances to finish the test in BS Test - **WORKING MEMORY**
- **SYN** piglets were quicker to learn in TM Test - **SPATIAL MEMORY**
- **SYN** piglets tried the new rewarded arm earlier in the TM Test - **REFERENCE MEMORY**
Conclusions

• Short-term feeding strategy (2 or 4 weeks) can have both short- and long-term effects

• **Study 1:** NA pigs appeared less interested by novel objects and more sensitive to environment and management than A and GLN

• L-glutamine appeared to confer similar benefits to, and thus could be a viable alternative to dietary antibiotics

• **Study 2:** The synbiotic supplement may confer memory advantages in the 3 cognitive tasks, regardless of the nature of the reward and the memory request.

• Beneficial effects occurred both **before** and **after weaning**
Study 1:
• Differences in microbiota between treatments at end of 14d feeding period.
• No differences 3 weeks later

Study 2:
• No differences in microbiota between treatments at d14
• Tendency at d33 (P<0.066)
• Different at d39 (P<0.044)
• Suggests we may have long-term impact on microbiota if we dose early
“the relationship between diet and the microbiota-gut-brain axis is ripe for exploitation to develop therapeutic strategies for treating stress-related disorders”
