Impact of high-wheat bran diet on sows’ microbiota, performances and progeny’s growth and health

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Objective

Improve piglets’ health without using antibiotics

HOW?

Acting on SOWS’ diet
→ Use of high quantities of wheat bran (WB)
Objective

Cereal by-product

Rich in insoluble NSPs

WHEAT BRAN

Ivarsson et al. (2014): pigs’ microbiota changes and increased butyrate production

Sows’ diet: bulking properties
Hypothesis

High WB diet

Microbiota changes

« Healthy » microbiota of piglets

Milk composition

Boost piglets’ immunity
Methods

7 CON sows & 8 WB sows

Gestation
240g/kg DM WB

Lactation
140g/kg DM WB

ELISA, mid-infrared

Sequencing

SCFA Sequencing
Results: performances

• Backfat/bodyweight changes: no impact of treatment (p=0.60 and p=0.77, respectively)

• Litters’ bodyweights: no effect of maternal treatment (p=0.51) from birth until weaning

• Ingestion of both groups similar except for the last 4 days of the lactation period (drop in WB ingestion), 66% of their planned feed intake-curve WB group vs 89% CON group
Results: performances

- Ingestion of both groups similar except for the last 4 days of the lactation period (drop in WB ingestion), 66% of their planned feed intake-curve WB group vs 89% CON group.
Results: milk composition

Chemical composition of milk at different time points

IgA and IgG concentrations of sow milk at different time points
Results: MICROBIOTA

THE BIG PICTURE...
<table>
<thead>
<tr>
<th></th>
<th>Gestation BEFORE diet change (G-)</th>
<th>Gestation AFTER diet change (G+)</th>
<th>Lactation (L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WB G-</td>
<td><img src="image1" alt="Graph" /></td>
<td><img src="image2" alt="Graph" /></td>
<td><img src="image3" alt="Graph" /></td>
</tr>
<tr>
<td>WB G+</td>
<td><img src="image4" alt="Graph" /></td>
<td><img src="image5" alt="Graph" /></td>
<td><img src="image6" alt="Graph" /></td>
</tr>
<tr>
<td>CON G-</td>
<td><img src="image7" alt="Graph" /></td>
<td><img src="image8" alt="Graph" /></td>
<td><img src="image9" alt="Graph" /></td>
</tr>
<tr>
<td>CON G+</td>
<td><img src="image10" alt="Graph" /></td>
<td><img src="image11" alt="Graph" /></td>
<td><img src="image12" alt="Graph" /></td>
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<tr>
<td>CON L</td>
<td><img src="image13" alt="Graph" /></td>
<td><img src="image14" alt="Graph" /></td>
<td><img src="image15" alt="Graph" /></td>
</tr>
</tbody>
</table>

Legend:
- Lactobacillus
- Treponema
- Phascolarctobacterium
- Streptococcus
- Oscillospira
- Ruminococcus
- Clostridium
- CF231
- Faecalibacterium
- Megasphaera
- Bifidobacterium
- Fibrobacter
- Roseburia
- Butyribivrio
- Parabacteroides
CONTROL GROUP

CON G-

CON G+

CON L

Phascolarctobacterium

3.35% → 2.66%

Clostridium

2.14% → 1.25%

Anecdotal

CF231

2.22% → 1.35%

Anecdotal

Bifidobacterium

Butyrivibrio
Results: MICROBIOTA

AND THE DETAIL...

(The Human Microbiome Project says the human body has 100 trillion microscopic life forms living in it.)

(Duke University student affairs)
Occurrence in the microbiota (%)

**CON G-**

- 2.44

**CON G+**

- 6.47

**Streptococcus CON G-/G+**

**Occurrence in the microbiota (%)**

- Sample 1: 0%
- Sample 2: 2%
- Sample 3: 4%
- Sample 4: 6%
- Sample 5: 8%
- Sample 6: 10%
- Sample 7: 12%
- Sample 8: 14%
- Sample 9: 16%
- Sample 10: 18%
- Sample 11: 18%
- Sample 12: 18%

G- | G+
Conclusion

- No impact of dietary treatment on performances except for ingestion (last period)
- No impact on milk composition

Increasing WB proportion is not detrimental

- Conclusions concerning microbiota hard to draw due to high variability between individuals
Next step

• Microbiota and short-chain fatty acids (SCFA) of piglets
  – Related to sows?
  – Microbiota vs SCFA correlation?
  – Less variability for piglets’ microbiota?
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