A good start is half the battle won: Early life interventions in piglets program intestinal development and colonization.

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Intestinal Health:
Intestinal tract is a complex system

- Epithelial layer:
  - Barrier function
  - (Re)-absorption

- Immune cells:
  - Intra epithelial lymphocytes
  - GALT

- Microbiome
Intestinal Health: Interactions in gut (co)-determine animal performance

Environmental factors:
pathogens, toxins, treatments, social interactions, stress, housing, transportation, etc.

75% of immune system
$10^{14}$ microbiota (800-1200)

- Feed
- Excreta

- microbeota
- gut
- host

- Digestive efficiency
- Immune competence
- Animal performance
Intestinal Health:
Interplay microbiota and immunological development
Antibiotic treatment in early life:
Effects of early colonization on immune development

- Piglets are treated with tulathromycin with or without additional stressors (tail clipping, ear tags)
- How do these factors affect microbial colonization?
- Does this affect intestinal development later in life?

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Tulathromycin</th>
<th>Stressor</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>T2</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>T3</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Antibiotic treatment in early life:
Diversity of jejunal microbiota

- Intestinal microbial diversity affected at day 8 and 176, but not at day 55
- Tulathromycin increases diversity early in life, and decreases diversity later in life
Anitbiotic treatment in early life:
Composition of jejunal microbiota at day 8
Antibiotic treatment in early life:
Intestinal gene expression affected

Number of regulated genes per treatment.

<table>
<thead>
<tr>
<th>Day / Tissue</th>
<th>T2 vs T1</th>
<th>T3 vs T1</th>
<th>T3 vs T2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Down</td>
<td>Up</td>
<td>Down</td>
</tr>
<tr>
<td>Day 8 - Jejunum</td>
<td>63</td>
<td>24</td>
<td>29</td>
</tr>
<tr>
<td>Day 8 - Ileum</td>
<td>80</td>
<td>49</td>
<td>80</td>
</tr>
<tr>
<td>Day 55 - Jejunum</td>
<td>182</td>
<td>823</td>
<td>1042</td>
</tr>
<tr>
<td>Day 55 - Ileum</td>
<td>306</td>
<td>315</td>
<td>663</td>
</tr>
<tr>
<td>Day 176 - Jejunum</td>
<td>19</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Day 176 - Ileum</td>
<td>1</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

- Many genes differentially expressed between treatments especially around weaning
- Hardly any differences at day 176 remaining

ANOVA p<0.05 & |FC|>1.5
Antibiotic treatment in early life:
Development of chemokine signalling network on day 8
Antibiotic treatment in early life: Effects as function of time

- Treatment @ d4
- Immune programming @ d8
- Instable chaos at d55
  - Weaning
  - Recolonization gut
- Stable adult situation
  - Different microbiota
  - Gene expression adapted
Frutoooligosaccharides pre-weaning: Microbiota composition

- Fructooligosaccharides (FOS) supplementation shifts microbiota in colon
- FOS has no effect on microbiota composition in jejunum
- Diversity of microbiota in colon not affected by FOS treatment at day 14
Fructooligosaccharides pre-weaning: Microbiota composition

- Changes in microbiota due to FOS are bifidogenic: more bifidobacteriaceae
- Bifidogenic profile is associated with healthier gut
FOS supplementation

- Affects microbiota composition in colon
- Gene expression in jejunum @ day 25
  - More cell cycle processes
  - Higher villi
  - Deeper crypts
  - Decrease in immune processes
Yoghurt-like milk supplement (YMS) before weaning improves intestinal growth and development in piglets

- Study effect of energy-dense YMS (Milkiwean®) with a high dry matter content on intestinal growth and development
Slides 15-28 are removed

- Our apologies

- These slides will be published once the scientific paper is accepted for publication
A good start is half the battle won: *Early life interventions in piglets program intestinal development and colonization.*

- Interventions early in life shape intestinal development and microbiota composition
- Interventions early in life potentially have long-lasting effects on (gut) health
- Nutritional programming will help to improve health
Credits

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- Mari Smits
- Lisette Ruuls
- Ralph Kok

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