Future Nutrition for Piglet Health

Thursday 4th of June 2015
Menu of the day

Future nutrition for piglet health

- **Appetizer:** introduction
- **Entrée:** suckling phase
- **Main dish:** around weaning
- **Dessert:** recipe to grow
- **Take home message**
High prolific sows: ↑ Embryos > ↑ Total Born Piglets
- ▼ Birth weight
- ↑ IUGR piglets
- ▼ Gut development
- ▼ Less colostrum per piglet
- Ban on antibiotics

High quality piglet feed
Appetizer

Gut development after birth

- Morphology > profound changes!
  - Villi length
  - Mucus ↑
  - Brush border enzymes
- Microbial colonization & diversity

Bacteria > Immune development!

Induced by first feeding

Source: Skrzypek T. et al, 2005 – SEM of small intestines
Gut after weaning > ↓FI, composition

- Morphology
  - Crypte depth ↑ & ↓↓ villi length (~50%) (Verdonk et al., 2006)
  - Mucus ↘
  - Loss integrity, ↗ enzymes
- Dysbacteriosis
- Immunity

✔️ ✔️ Performance & Defence

Source: Skrzypek T. et al. 2005
A Golden Start

1. **Colostrum** (milk) intake
   - Passive immunity, gut and organ development
2. **Microbial** gut colonization
   - ‘Core’ microbiota, development immunity system
3. **DM intake** in suckling phase (prestarter *)
   - Influences 44% performance  Cargill Research 2013

*(Gaskin 1997, Kelly et al. 2007, Schokker et al. 2015, Lewis 2015)*

* Madsen J., EPP June 2014
Entrée

**Importance of feed intake** in suckling period

Recent study

- Tasteful & high quality feed
- Liquid (24h/d fresh) vs dry (5x/d) >> 3 x ↑ DM intake
- Avoid weaning dip
  - 30% ↓ small piglets
  - 2% ↓ culled piglets

Source: SIC Sterksel, 2014

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Neopigg RescueCare</th>
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</thead>
<tbody>
<tr>
<td>Day 1</td>
<td>170</td>
<td>250</td>
</tr>
<tr>
<td>Day 2</td>
<td>230</td>
<td>250</td>
</tr>
<tr>
<td>Day 3</td>
<td>210</td>
<td>220</td>
</tr>
<tr>
<td>Day 4</td>
<td>200</td>
<td>240</td>
</tr>
<tr>
<td>Day 5</td>
<td>210</td>
<td>250</td>
</tr>
<tr>
<td>Day 6</td>
<td>220</td>
<td>270</td>
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<tr>
<td>Day 7</td>
<td>250</td>
<td>310</td>
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</table>
Importance of feed intake in suckling period

- ↑ Performance in Nursery period
  - + 8% ADG
  - FCR =
  - Effect ↑ small piglets

Weight development from day 2 till day 62 of age

Source: SIC Sterksel, 2014
Main dish

- Basic ingredients
  - Quality raw materials
  - Structure and feed processing
  - Digestibility
    - Proteins!
  - Fibers
    - Gut health, microbiota
Main dish

Basic ingredients

CNS nutrient: **Fermentable protein (gut FP)**

Digestibility rate important!

<table>
<thead>
<tr>
<th>Raw material</th>
<th>Crude protein (%)</th>
<th>3 hour</th>
<th>24 hour</th>
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</thead>
<tbody>
<tr>
<td>Hipro soybean meal</td>
<td>48</td>
<td>85</td>
<td>94</td>
</tr>
<tr>
<td>Soy protein concentrate</td>
<td>62</td>
<td>92</td>
<td>97</td>
</tr>
<tr>
<td>Fermented soybean meal</td>
<td>50</td>
<td>88</td>
<td>95</td>
</tr>
<tr>
<td>Enzymatically treated soybean meal</td>
<td>56</td>
<td>88</td>
<td>94</td>
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<tr>
<td>Potato protein 1</td>
<td>81</td>
<td>76</td>
<td>95</td>
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<tr>
<td>Potato protein 2</td>
<td>78</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>Rice protein concentrate</td>
<td>69</td>
<td>70</td>
<td>82</td>
</tr>
<tr>
<td>Provisoy</td>
<td>52</td>
<td>93</td>
<td>96</td>
</tr>
</tbody>
</table>

In vitro test
Screen protein sources
Main dish

- **Basic ingredients**
  - Gut FP
  - ↓ Gut FP = ↑ gut health
  - Better performance

![Graph showing the relationship between FP intake and incidence of diarrhea using visual scoring. The equation is given as y = 0.129x + 0.2073, with R² = 0.9933.]

Cargill Research, 2013
Main dish

Basic ingredients

Fibers
- Amount
- Type, function

> CNS: CHO-FRM & CHO-STR

Structural Carbohydrates
- Insoluble

Fermentable Carbohydrates
- Soluble

Digestible Carbohydrates

Straw, oat hulls, Sunflower hulls, Wheat bran

Sugarbeet pulp, Citric pulp, chicory pulp (inuline), resistant starch

Starch and sugars
Main dish

Basic ingredients

- Trial Cargill
  - Ph1 – effect FRM
  - Ph 2 & 3 + effect FRM

Graph:
- Incidence of bad stool (0 = good stool; 1 = bad stool)
  - Phase 1 (day 0-11 p.w.)
  - Phase 2 (day 11-21 p.w.)
  - Phase 3 (day 21-42 p.w.)
  - Overall (day 0-42 p.w.)

Legend:
- Cho-frm 10.7%
- Cho_str 4.2%
- Cho-frm 11.1%
- Cho_str 7.8%
- Cho-frm 13.8%
- Cho_str 4.5%

Cargill Research 2013
Main dish

- Pepper & salts
  - Health concept additives
    - Acids, EO, AO, MCFA’s, prebiotics (AXOS, FOS, XOS)...

E.g. Innovative Additive blend

- ↑ ADG, ↑ FI, = FCR
- ↓ Diarrhea
- ↓ AB use

Cargill Research, 2015
Future piglet feeding

- Early influencing ‘functional’ microbiota via feed composition
- Tools
  - Q-PCR: specific primers for functional genes
  - VFA profiling
  - Biomarkers
- Ongoing research 2015
  - Cargill Global Research & Ghent University
  - Cargill WE & Antwerp University & Ilvo
Future piglet feeding

- Early influencing ‘functional’ microbiota via feed composition
  - Key for immunity & mucosal health
- Tools
  - Q-PCR: specific primers for functional genes
  - VFA profiling
  - Biomarkers
- Ongoing research 2015
  - Cargill Global Research & Ghent University
  - Cargill WE & Antwerp University & Ilvo
Recipe to grow

- Good start =
  - Stable divers gut microbiota
  - ↑ Gut mucosa health
  - ↑ Immunity

> Capability to grow in the nursery and fattening period without antibiotics
New research, Sterksel 2014

+ 36g/day = FCR
- 2.5d delivery

↓ AB use
↓ culling

End nursery
Weaning + 2.0kg
+ 0.8 kg

Source: SIC Sterksel, 2014
Take home message

Healthy piglet > ↑ growth potential as fattener

- Colostrum intake
- Feed intake > suckling phase
- Feed composition
  - Balanced Microbiota!
    - Low gut FP & fiber type
  - Phase feeding
  - Additives

Link gut microbiota, mucosa and immunology: a complex triangle!
Thanks for your attention!

?? Questions ??