Nutrient balances of energy, lysine and nitrogen in late gestating and early lactating sows

Takele Feyera and Peter Kappel Theil

Dept. of Animal Science
Aarhus University

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Introduction

During the transition period (D -10 to + 10)……

- Foetuses and reproductive organs develop fast
- Sow energy balance becomes negative (anabolic -> catabolic metabolism)
- At parturition: Drop in LW, increase in ME-requirement
- Colostrum is produced and secreted
- Milk production begins and yield increases day by day
- Heat production increases due to colostrum/milk synthesis
- Diet is changed from gestation to lactation diet
We need to focus on traits which quantitatively affects nutrient requirements – e.g. mammary and foetal growth

Day 105  
1097 g

Day 114  
1560 g
Aim of project:
To quantify the requirements and balances of energy, lysine, and nitrogen for sows during transition:

Ultimate goal:
- Improve sow productivity
- Minimise sow mobilisation during lactation
- Reduce feed intake over a reproductive cycle
Method:
Sow requirements of energy, lysine, and nitrogen were calculated factorially:

Foetal growth (Noblet et al., 1985)
Uterus, placenta, fluids and membranes (Noblet et al., 1985)
Mammary growth (Kim et al., 2000)
Milk yield and composition (Hansen et al., 2012)
Maintenance (Theil et al., 2002, 2004, NRC 2012)
Colostrum yield and composition (Theil et al., submitted)
Nutrient requirement during late gestation (ass. no mobilization)

- Dietary nutrients (Energy, Lysine, Nitrogen)
  - Foetal growth
  - Mammary growth
  - Uterus
  - Colostrum (Milk)
  - Placenta+
  - Fluids + membranes

Maintenance
(N: Urine incl. additional N loss, E: + additional heat loss)
Nutrient requirement during **early lactation** (ass. no mobilization)

- **Maintenance**
  - \( N: \) Urine incl. additional N loss,
  - \( E: + \) additional heat loss

- **Dietary nutrients**
  - (Energy, Lysine, Nitrogen)

  - **Mammary growth**
  - **(Colostrum)**
  - **Milk**
  - **Uterus**
Energy requirement during transition (MJ ME/d)
Lysine requirement during transition (g/d)
Nitrogen requirement during transition (g/d)
## Requirements at d 105

<table>
<thead>
<tr>
<th></th>
<th>Energy</th>
<th>Lysine</th>
<th>Nitrogen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 105</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Day 114</td>
<td>102</td>
<td>124</td>
<td>105</td>
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<tr>
<td>Day 10</td>
<td>206</td>
<td>309</td>
<td>214</td>
</tr>
</tbody>
</table>

Relative requirements of energy and lysine (d 105 = index 100)
Nutrient balances during transition

Diet shift

Fl: 3.5 kg/d  2.5 kg/d  4.5 kg/d  6.5 kg/d
Conclusions

Requirements/utilization change dramatically during transition

Limiting factors: Nitrogen before parturition (?), energy in early lactation (and lysine at peak lactation)

A two diet feeding strategy to transition sows can much better target the rapidly changing requirements than a single diet can
Questions?