NUTRITION-RELATED FACTORS AFFECTING PIG SURVIVABILITY

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Global Tech Service Manager
Jefo Nutrition
OUTLINE

• Economic impact of survivability

• General factors affecting pig survivability

• Nutrition-related factors affecting pig survivability

• Breeding herd

• Wean-to-finish
ECONOMIC IMPACT OF MAJOR PRODUCTION PARAMETERS

<table>
<thead>
<tr>
<th>Phase</th>
<th>Parameter</th>
<th>Change</th>
<th>Value of Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sow Farm</td>
<td>Litters/Sow/Yr</td>
<td>0.03 litters/sow</td>
<td>$10/sow/yr</td>
</tr>
<tr>
<td></td>
<td>Farrowing Rate</td>
<td>1.25%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Non-Productive Days</td>
<td>4.1 days</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Born Alive/Litter</td>
<td>0.15 pigs/litter</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre-Wean Mortality</td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sow Mortality</td>
<td>2%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wean-Finish Mortality</td>
<td>0.6%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Feed Conversion Ratio</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average Daily Gain</td>
<td>5 g/day</td>
<td></td>
</tr>
<tr>
<td>Finisher</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PIC, 2018
SURVIVABILITY BY PHASE OF PRODUCTION

<table>
<thead>
<tr>
<th>Phase</th>
<th>Top 10%</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nursery</td>
<td>99.0</td>
<td>97.2</td>
</tr>
<tr>
<td>Finishing</td>
<td>98.4</td>
<td>97.6</td>
</tr>
<tr>
<td>Wean-to-finish</td>
<td>97.1</td>
<td>95.2</td>
</tr>
</tbody>
</table>

Internal database
“If you always do what you always did, you will always get what you always got.”

Albert Einstein
GENERAL FACTORS AFFECTING PIG SURVIVABILITY
GENERAL FACTORS AFFECTING PIG SURVIVABILITY

EFFECTS OF COMMON DISEASES ON PIG SURVIVABILITY

Mortality + removals

<table>
<thead>
<tr>
<th>Disease</th>
<th>Mortality + removals</th>
</tr>
</thead>
<tbody>
<tr>
<td>M hyo</td>
<td>2.15</td>
</tr>
<tr>
<td>PRRS</td>
<td>1.68</td>
</tr>
<tr>
<td>SIV</td>
<td>1.87</td>
</tr>
<tr>
<td>PRRS + M hyo</td>
<td>5.43</td>
</tr>
<tr>
<td>PRRS + SIV</td>
<td>4.34</td>
</tr>
<tr>
<td>SIV + M hyo</td>
<td>3.46</td>
</tr>
</tbody>
</table>

$P < 0.05$

Combination vs. Each individual disease

Dykhuis Haden et al, 2012
EFFECTS OF COMMON DISEASES ON PROFITABILITY

Dykhuis Haden et al, 2012
GENERAL FACTORS AFFECTING PIG SURVIVABILITY

GENETIC TRENDS FOR PRE-WEANING SURVIVABILITY

Pre-wean survivability
GENERAL FACTORS AFFECTING PIG SURVIVABILITY

PROBABILITY OF MORTALITY UNTIL 42 DAYS OF AGE BASED ON COLOSTRUM INTAKE AND BIRTH WEIGHT

Ferrari et al., 2016
WEANING AGE ON NURSERY MORTALITY

<table>
<thead>
<tr>
<th>Wean age, d</th>
<th>Mortality, %</th>
<th>SEM</th>
<th>Linear, P&lt;0.09</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>5.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>2.82</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>2.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>0.54</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.5</td>
<td>2.17</td>
<td>0.76%</td>
<td></td>
</tr>
<tr>
<td>18.5</td>
<td>1.56</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21.5</td>
<td>1.30</td>
<td>0.36%</td>
<td></td>
</tr>
</tbody>
</table>

Main et al., 2004

GENERAL FACTORS AFFECTING PIG SURVIVABILITY
NUTRITION-RELATED FACTORS AFFECTING PIG SURVIVABILITY
BREEDING HERD
SOW BODY CONDITION IS KEY TO IMPROVE PIGLET SURVIVAL

A total of 2460 sows were used.

Bryan and Knauer, 2014

A total of 2460 sows were used.
HIGH FAT IN LATE GESTATION IMPROVED PRE-WEANING SURVIVABILITY

Improvement in survivability (fat vs. control), %

Survival rate, %

<80  >80

4.1*  0.6

*P<0.05
SEM = 1.7

How about for today’s leaner pigs and larger litter size?

Pettigrew, 1981
HIGH FAT IN LATE GESTATION IMPROVED PRE-WEANING SURVIVABILITY

**Improvement in survivability (fat vs. control), %**

- **< 1 kg**: -5%
- **1-2 kg**: 8.3%
- **2-4 kg**: 15.2%
- **> 5 kg**: 1.7%

*P < 0.05
SEM = 3.7

**Practical considerations of implementation (feed lines and flowability)**
“BUMP FEEDING” CAN INCREASE 2.1% STILLBORNS IN SOWS, BUT NOT IN GILTS

Parity x Energy, P = 0.01
SEM = 0.8

Stillbirth, %

Feed intake equiv., kg/d
(2.5 Mcal NE/kg diet)

Giltsa
3.4
4.4a
2.7

Sowsa
3.4
6.5b

NUTRITION-RELATED FACTORS AFFECTING PIG SURVIVABILITY

“BUMP FEEDING” can increase 2.1% stillborns in sows, but not in gilts. (Gonçalves et al., 2016)
LYSINE LEVELS DURING GESTATION CAN REDUCE STILLBORNS IN SOWS, BUT NOT IN GILTS

Stillborn, %

<table>
<thead>
<tr>
<th>SID Lys, g/d</th>
<th>Gilts</th>
<th>Sows</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>2.8</td>
<td>4.6</td>
</tr>
<tr>
<td>13.5</td>
<td>2.2</td>
<td>3.3</td>
</tr>
<tr>
<td>16</td>
<td>3.0</td>
<td>3.5</td>
</tr>
<tr>
<td>18.5</td>
<td>2.9</td>
<td>2.3</td>
</tr>
</tbody>
</table>

SEM = 0.54
Trt x Parity, P = 0.043
Linear, P = 0.109
Linear within sows, P = 0.002
Quadratic, P = 0.762

Thomas et al., 2018

NUTRITION-RELATED FACTORS AFFECTING PIG SURVIVABILITY
Nutrition-related factors affecting pig survivability

Net profit difference per weaned pig from stillborn and cull sow weight change

$308/Short ton, $1380/short ton L-Lys

Thomas et al., 2018
125 PPM OF YUCCA EXTRACT DURING GESTATION REDUCED STILLBORNS ON 0.4 PIGS

**Nutrition-related factors affecting pig survivability**

<table>
<thead>
<tr>
<th>Study</th>
<th>Improvement (125 ppm yucca extract v. control), n</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.35†</td>
</tr>
<tr>
<td>B</td>
<td>0.27*</td>
</tr>
<tr>
<td>C</td>
<td>0.43*</td>
</tr>
<tr>
<td>D</td>
<td>0.34</td>
</tr>
<tr>
<td>E</td>
<td>0.3*</td>
</tr>
<tr>
<td>F</td>
<td>0.68*</td>
</tr>
<tr>
<td>G</td>
<td>0.27†</td>
</tr>
<tr>
<td>H</td>
<td>0.67†</td>
</tr>
<tr>
<td>I</td>
<td>0.6</td>
</tr>
<tr>
<td>J</td>
<td>0.4*</td>
</tr>
</tbody>
</table>

*P<0.05 †P<0.10
125 PPM OF YUCCA EXTRACT IN GESTATION AND LACTATION REDUCED PRE-WEEANING MORTALITY

Study | Improvement in PWM (125 Ppm yucca extract v. control), %
--- | ---
A | 4.74* 
B | 2.39† 
C | -0.15 
D | 4.1 
E | 5.0† 
F | 
G | 
H | 2.84 
I | 
J | 

*P=0.09  
†P=0.12  

Life, made easier
FULL FEED FROM DAY OF FARROWING

Source: Mike Tokach
NUTRITION-RELATED FACTORS AFFECTING PIG SURVIVABILITY

FRESH FEED
NUTRITION-RELATED FACTORS AFFECTING PIG SURVIVABILITY

FEEDER ADJUSTMENT
NUTRITION-RELATED FACTORS AFFECTING PIG SURVIVABILITY
WEAN-TO-FINISH HERD
LOW FEED INTAKE IN THE FIRST WEEK AFTER WEANING IS ASSOCIATED WITH INCREASED RISK OF DIARRHEA

Madec et al., 1998; n = 106 farms
FOCUS ON PIGS THAT ARE LOSING WEIGHT IN THE 1ST WEEK AFTER WEANING, ESPECIALLY LIGHT-WEIGHT PIGS

Example in a barn with 2,400 pigs

Light = <5.1 kg, Medium = 5.1 to 5.9 kg, and Heavy >5.9 kg.

Faccin et al., 2018
NUTRITION-RELATED FACTORS AFFECTING PIG SURVIVABILITY

DIETARY ENERGY AND FIBER ON REMOVAL AND MORTALITY RATE

Removal + Mortality rate, %

<table>
<thead>
<tr>
<th>NE, Mcal/kg</th>
<th>2.10</th>
<th>2.21</th>
<th>2.31</th>
<th>2.42</th>
<th>2.52</th>
<th>2.63</th>
<th>2.73</th>
</tr>
</thead>
<tbody>
<tr>
<td>NDF, %</td>
<td>23</td>
<td>20</td>
<td>17</td>
<td>14</td>
<td>13</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>6.8</td>
<td>8.1</td>
<td>3.5</td>
<td>3.8</td>
<td>3.8</td>
<td>4.8</td>
<td>6.1</td>
</tr>
</tbody>
</table>

Linear, P=0.297
Quadratic, P=0.020
SEM = 3.1

Life, made easier

PIC, 2018
VICES WERE NUMERICALLY MORE PREVALENT IN LOW ENERGY DIETS

NE, Mcal/kg

Removal rate, %

PIC, 2018

Could not analyze statistically because there is no data of reason per pen, only per treatment.
AMINO ACID DEFICIENT DIETS MAY HAVE NEGATIVE INFLUENCES ON BEHAVIOR, ESPECIALLY IF OTHER ENVIRONMENTAL FACTORS ARE ALSO LIMITING.

- Pigs were exposed daily to two sections of cotton cord:
  - Soaked with pigs' blood and dried
  - Plain.

“...may help to explain the widely reported link between dietary inadequacies and tail-biting.”

Fraser et al., 1991

©PIC
ANTIBIOTIC GROWTH PROMOTING ALTERNATIVE TRIALS ON REDUCING PIG MORTALITY

Percentages for not reported (nr), positive response (+) equates to reducing mortality, negative response (-) equates to increasing mortality, and no change from control treatment (0). Number of trial shown in (n=x).

Schweer et al., 2017
Nutrition-related factors affecting pig survivability

**XYLANASE**

![Graph showing the effect of xylanase on mortality percentage](image)

- **Mortality, %**
  - SEM, 0.82
  - Linear, P = 0.126

Rush, Remus and Boyd, 2014
EFFECTS OF PELLETING REGIMEN ON STOMACH MORPHOLOGY (ULCERATION & KERATINIZATION)

2,100 pigs (PIC 327 x 1050, initially 31.5 kg BW)

Nutrition-related factors affecting pig survivability

K-State Research and Extension
De Jong et al., 2015

abc P < 0.05 SEM = 0.613
DIET FORM AND SIRE LINE ON PROGENY VIABILITY UNDER CONDITION OF LOW IMMUNE STRESS

Line A vs B, P > 0.10
Diet form, P < .01

Boyd et al., 2012; 2,839 pigs on test.
DIET FORM AND SIRE LINE ON PROGENY VIABILITY UNDER CONDITION OF **HIGH IMMUNE STRESS**

Line A vs B on meal, $P < .01$

Line A vs B on pellets, $P < 0.01$

Diet form, $P < 0.001$

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**NUTRITION-RELATED FACTORS AFFECTING PIG SURVIVABILITY**

Boyd et al., 2012; 3,160 pigs on test.
IMPLEMENTATION OF THE NUTRITION PLAN

• "Out-of-feed events are a known cause of ulcers in pigs and are suspected of being associated with increased incidence of hemorrhagic bowel syndrome" (Brumm et al., 2005).

• Correct implementation and auditing of the nutritional program is even more important than the program itself.
ONE-PAGE SUMMARY

• To maximize survivability, review all areas of production.
  ✓ Eliminate disease
  ✓ Maximize colostrum intake
  ✓ Review weaning age
  ✓ 0.6% WF survival equals $10/sow/year

• Several approaches to improve pig survivability through nutrition:
  ✓ Sows: BCS and AA
  ✓ Energy x tail biting
  ✓ AA x tail biting
  ✓ Yucca, Xylanase, Organic acids
  ✓ Pellet x Meal
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• Dr. Trey Kellner
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• Dr. Kyle Coble
• Dr. Josh Flohr
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