Parity Segregation of Production Flows to Improve Profit

R. Dean Boyd, Ph D
Technical Director and Nutritionist
The Hanor Company

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Sow Productive Lifetime
Acknowledgements

Paper is presented with due Recognition to the founding Team: M. Mortenson, J. Mencke, J. Keane and G. Castro.

Team initiated the First Segregation of Parities in 1996 with the expectation of increasing Life-time Pig Output thru age specific Management and Nutrition (Mencke, 1998. Leman Suppl. P. 19)

Benefits of Pathogen Control in their Progeny was later unveiled with Segregation of Gilt progeny in 2002.*

Co-authors:
Bob Meurer
Dr. Tara Donovan
Dave Wade

* Camille Moore, 2001 (A.D. Leman, 2001, p. 203)
Roadmap

- Parity Segregated Production to Capture Genetic Potential
- Proofs – These things we know to be True
- The Gilt – A Problem of Pathogen Control
- Mom’s Influence on her progeny is Remarkable and Long-term
- Financial Benefit – Was it worth the effort to Segregate?
Parity Segregated Production
Why it Works - What it Means Economically

Segregation – definition

Segregation means to separate some thing for special treatment.

Pig Segregation Formats have as main objective – Pathogen Control
- Medicated Early Wean
- AIAO Production
- Multi-site Production

Parity Segregation receives most of the present Emphasis
- Young Sow sub-population
- Mature Sow
- Segregate Progeny of Young and Mature Sow for Growth

Purpose: Pathogen Control, Reproduction via specific Nutrition
Example Benefits of Parity Segregation:

- Health stabilization of Sow Herd
- Pathogen Control through *strategic* Vaccination, Medication
- Medication Savings – Improved Profit in Progeny Flow
- Nutrition *specific* to different needs of Young and Mature Sows
- Life-time Pig Output
Parity Segregated Production
Why it Works - What it Means Economically

The Reality of Wean Pig Health (Pathogen Control)

The Quality of Pigs at Entry to the Nursery is described to a large extent by these Factors:

✓ Sow age (gilt progeny more likely to carry pathogens & infect)
✓ Wean weight (pigs >30% below mean)
✓ Piglet age (pigs <15 d old)
✓ Sow Farm (SEW will not produce pigs of consistent health status)
✓ Gender (males more vulnerable esp. health unstable flows)

‘It appears that the presence of higher risk animals does affect the rest of the population and cause higher Mortality than low risk animals’

John Deen, DVM, Ph D
Parity Segregated Production
Why it Works – What it means Economically

Maternal Nutrition is Age-dependent \( (LS = f(Nutrition)) \)

Organizing the Sow Farm to Nutritionally manage Maiden and First Litter Sows then to Adjust Nutrient Level for the ‘Older’ Sow has Improved Life-time Pig Output (New Axiom).

Amount and Type of Nutrients differ for:
(1) First and 2\(^{nd}\) Litter Sows when compared to
(2) Mature and Aging Sows

Primary Outcomes: Pigs born alive and Weaned per Sow Life-time
Parity Segregation – **1996 Template**

Separation of Sows into 3 Sub-populations within the Farm

- **First Litter**
  - 2650
  - Lactation, 1. 40%

- **Litters 2-3**
  - 2650

- **Litters 4-10**
  - 2650

- **Breeding Prep Center**
  - Health Acclimatization
  - Physiological age
  - Body mass

- **Gilt Develop. Center**
  - Immunity
  - Skeleton
  - Nutrition
  - Space
  - Puberty

- 180 d Age

- 0.56% Micro-Nutrients

- 2650
Honor Trails End I Sow Farm
Young and Mature Sow Groups are Segregated
Selected Concepts

The Proof

These things we Know to be True!
Selected Concepts

The Young Sow

There is a Problem inherent to the Gilt!

Her Progeny are more susceptible to Pathogens, have greater Mortality and Medication Cost
The Problem of Progeny from the Young Sow
Apparent Lack of Progeny Immune Competence

<table>
<thead>
<tr>
<th>Item</th>
<th>Gilt Progeny</th>
<th>P2+ Progeny</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wean weight (kg)</td>
<td>5.30</td>
<td>5.74</td>
</tr>
<tr>
<td>Nursery mortality (%)</td>
<td>3.17</td>
<td>2.55</td>
</tr>
<tr>
<td>Nursery ADG (g/d)</td>
<td>412</td>
<td>435</td>
</tr>
<tr>
<td><strong>Nursery drug cost (CDN $)</strong></td>
<td>2.15</td>
<td>0.85</td>
</tr>
<tr>
<td><strong>Finishing Mortality (%)</strong></td>
<td>4.31</td>
<td>2.95</td>
</tr>
<tr>
<td>Finishing ADG (g/d)</td>
<td>735</td>
<td>763</td>
</tr>
<tr>
<td><strong>Finishing drug cost (CDN $)</strong></td>
<td>1.82</td>
<td>1.01</td>
</tr>
<tr>
<td>Lungs with enzootic pneumonia lesions (%)</td>
<td>31</td>
<td>11</td>
</tr>
</tbody>
</table>

Adapted from C. Moore, 2001 (more than 5000 pigs per column)
Distribution of First Litter Piglet Birth-weight

How much Smaller are Gilt Progeny?

Red Bar = 1543 piglets from 1st Parity
Blue Bar = 4496 piglets from 2nd - 7th Parity
Average Piglet birth weight = 3.2 lbs for 1st parity and 3.6 lbs for 2nd - 7th parity
Set the Stage:

Piglet Flow from Parity Segregated Sow Farms

P-1 Farm 1

P-1 Farm 2

P-1 Nursery Units

P-1 Finish Units

P-2 Farm 1

P-2 Farm 2

P-2 Plus Nursery Units

P-2 Plus Finish Units
Death Loss for Progeny of Young and Mature Sows

2002-2004 data from ca 164,500 P-1 and 305,500 Mature Progeny placed
Growth Rate for Progeny of Young and Mature Sows

2004 Production, Meurer

SOURCE FARM

ADG, lbs/d

P-1 Flow  P-2 Flow

Nurse  Finish

0.92  1.95

0.91  2.03

SOURCE FARM
Carcass Mass and Carcass $ per 160 d Progeny of Young and Mature Sows

Source Farm

Average Wean Weight: P-1, 11.0 lbs; P-2, 12.3 lbs
Selected Concepts

The Sow Farm

Sow Farms also differ in Health status. This is reflected in Life-time Performance of their Progeny

1. Sow Age (Gilt Litters)
2. Sow Farm Health
Sow Farm Source also accounts for Mortality Difference

<table>
<thead>
<tr>
<th>SOURCE FARM</th>
<th>Nurse</th>
<th>Finish</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-1 Flow</td>
<td>2.99</td>
<td>5.01</td>
<td>8.00</td>
</tr>
<tr>
<td>P-2 Farm 3</td>
<td>3.24</td>
<td>4.67</td>
<td>7.91</td>
</tr>
<tr>
<td>P-2 Farm 1</td>
<td>2.64</td>
<td>3.33</td>
<td>5.97</td>
</tr>
<tr>
<td>P-2 Farm 2</td>
<td>2.31</td>
<td>3.46</td>
<td>5.77</td>
</tr>
</tbody>
</table>
Selected Concepts

Gender

Male Progeny are more Susceptible to Disease. This is most obvious when Health is Unstable. House by Gender for Strategic Medication?

1. Sow Age (Gilt Litters)
2. Sow Farm Health
3. Male Pigs
### Mortality Rate Comparison for Females and Castrates

**Nursery Health Stable – Finish Unstable (MYC, HPS)**

<table>
<thead>
<tr>
<th>Growth Phase</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurse</td>
<td>1.91</td>
<td>1.58</td>
</tr>
<tr>
<td>Finish</td>
<td>8.35 *</td>
<td>6.06 *</td>
</tr>
<tr>
<td>Total</td>
<td>10.26 *</td>
<td>7.64 *</td>
</tr>
</tbody>
</table>

Data from ca 368,000 pigs (50:50 M, F)

46 d Nursery and 135 d Finish period
Mortality Rate Comparison for Females and Castrates

Nursery Health Unstable (PRRS) - Finish Stable

<table>
<thead>
<tr>
<th>Growth Phase</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurse</td>
<td>4.03</td>
<td>2.02</td>
</tr>
<tr>
<td>Finish</td>
<td>3.05</td>
<td>2.77</td>
</tr>
<tr>
<td>Total</td>
<td>7.08</td>
<td>4.79</td>
</tr>
</tbody>
</table>

- P<.06 *
- N_M SD 3.01
- N_F SD 0.85

ca 68,850 each of Females and Castrates, N=27 / Sex
49 d Nursery and 140 d Finish period
Selected Concepts

Lactation Length

Research by Cabrera et al., 2001 illustrates how far reaching Maternal Influence is. Longer Lactation benefits Disease Resistance and Lean!

(Perhaps Vaccine Response)

1. Sow Age (Gilt Litters)
2. Sow Farm Health
3. Male Pigs
4. Piglet Age (Lactation length)
Wean Weight and Distribution Achieved
Sow-reared Control vs 2 Early Wean Ages

EW Sows were removed from the Litter after 2 or 14 d. Piglets remained in Crate until 20 d age.

- 20 Litters per Wean age resulting 228 – 244 pig each.

Cabrera et al., 2001
Maternal Influence on Growth from Weaning at 20 d of Age to 125 kg End Weight

20 Litters resulting in 228 – 244 pigs / treatment

P<.05   SD 6.3

<table>
<thead>
<tr>
<th></th>
<th>Average gain, g/d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sow 20 d</td>
<td>816(^a)</td>
</tr>
<tr>
<td>Sow 14 d</td>
<td>816(^a)</td>
</tr>
<tr>
<td>Sow 2 d</td>
<td>785(^b)</td>
</tr>
</tbody>
</table>

5.7 kg  7.5 kg  9.7 kg
Maternal Influence on Post-wean Mortality + Morbidity (removal) in a Health Stable Environment

Dead + Removed, %

- Sow 20 d: 1.3
- Sow 14 d: 3.0
- Sow 2 d: 4.2

Reported w/o statistical test
Maternal Influence through Lactation Length on Carcass Lean at 125 kg End Weight

Treatment different, P<.05, SD 0.4

- Sow 20 d: 55b
- Sow 14 d: 54.7ab
- Sow 2 d: 54.3a
Maternal Influence on RTUS Loin Depth at 125 kg End-weight

- Sow 20 d: 55.6 mm
- Sow 14 d: 53.8 mm
- Sow 2 d: 53.7 mm

P < 0.05, SD 0.5
Selected Concepts

Parity Segregation – Nutrition Perspective

Young and Mature Sow Sub-populations to improve Pig Output per Life-time

Boyd et al., 2006
AASV
Nutrition Stress **Impairs** Reproduction in Older Sows **has** a Different Basis than Young Sows

**Thesis:** Age-related LS Reduction has a **Nutritional** Basis

**How** Pregnancy Feed Intake is held constant across ALL Parities as a means of Weight Control (2.3 kg/d) . . . despite Increasing Body Weight with **each** Parity.

**Progressive Decline in micro-nutrients / kg b.w. with advancing age**

The **Older** (bigger) Sow is Increasingly at Nutritional Risk **Reproductively** and Immunologically
Is the Age-dependent Decline in Litter-size Premature?
Modulated by Lactation Length

Smits, 2003

Pigs Born Alive, p/L

Parity

25 d 15 d Wean
Progressive Decline in Micro-Nutrient Intake Occurs with Advancing Reproductive Age

Calculated from 2002 PIC USA ADFI assuming 0.149% Diet VTM
Boyd and Hedges, 2003
Research Suggested to Improve Sow Life-time Pig Output and Subsequent Progeny Viability

- Embryo Viability to 35 d bred improved with Immune modulation?
- Nutritional Basis for the Premature LS decline in Older Sows? Can this be addressed so LS weaned thru 9 litters is constant?
- Encourage Genetic Selection for Mammary Quality since pendulous Udders are the 1st limit to Livability in some Older Sow Lines
- Can the Immune Status of Gilt derived Progeny be improved so that Mortality and Medical Cost can be reduced?
- Develop an effective strategy to Improve the Livability of Male pigs?
Research Suggested to Improve Sow Life-time Pig Output and Subsequent Progeny Viability

- NPB should appoint a Working Committee to develop:
  
  ✓ (1) A Sow Management Guide (GMP) with a Financial Model for assessing the consequences of management choices;

  and

  ✓ (2) a Study team to create specific proposals for Research suggested from this meeting
Young and Older Sow Sub-Populations

Two Extremes in Life-cycle Nutrition Compromise Pigs Weaned

2006 Template
Hanor System

Gilt Develop
Young Sows P 0 – P 2
Mature & Aging P 3 – P 12

Focus
- Large First Litter (30 PSYba)
- Manage Body Protein
- 1st Wean most vulnerable

Critical Young Sow Nutrition is past when 1st Wean is 60 d bred w Reserves Reclaimed

Focus
- Prevent Premature LS
- Manage Micro-Nutrient
- Growth Restrict
Nutritionally manage for 1.8 – 3.3 more wean pigs per Sow Lifetime
Parity Segregation Improves Pathogen Control and Life-time Pig Output

1. Gilts Confer less Pathogen Protection

2. Gilt Progeny have different Medical needs after Weaning

3. Separation of Gilt and Sow Farm Flows reduced Disease. . . System Vet-related cost reduced by 20% (HOH soluble drugs, Injectable drugs, vaccines, Feed Med)

4. Unclear how to address Male mortality issue

5. Lactation Length is important to Progeny Viability, Growth and Lean (esp IF health unstable)

6. Nutrition Limits Litter-size in P 1-2 vs Older Sows but in different ways (See Keynote slides).

‘Everybody is chasing Ants while Elephants are running Wild!’ (the late Frank Aherne)
The End
Thanks for Coming!