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Induction of Farrowing

Dr. Tim Safranski
University of Missouri
(573) 884-7994
safranskit@missouri.edu
SowBridge
August 5, 2009

What?

• Physiological processes at parturition
  – lower serum progesterone
  – cervical dilation
  – myometrial contractions
  – lactation

Hormonal Changes that Control Parturition

<table>
<thead>
<tr>
<th>Steps</th>
<th>Fetal ACTH causes -</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fetal Corticosteroids causes -</td>
</tr>
<tr>
<td></td>
<td>Progesterone levels</td>
</tr>
<tr>
<td></td>
<td>placental production</td>
</tr>
<tr>
<td></td>
<td>or CL regression -</td>
</tr>
<tr>
<td></td>
<td>Production of Estrogens by placenta -</td>
</tr>
<tr>
<td></td>
<td>PGF2α production by uterus -</td>
</tr>
</tbody>
</table>

How?

• Regression of corpora lutea (CL) on ovary
  – prostaglandin-F2α
    • Lutalyse™, Prostamate™, (Estrumate™)
  – CL resistant through mid-gestation (until d108)
• Induction of myometrial contractions
  – oxytocin


Why?

• Induce Farrowing to Reduce Variation
  – gestation length
  – hour of the day

Reasons to Induce

• Reduced gestation length variation (111-119d)
  – cross-fostering
    • within 24 hr of birth
    • survival and uniformity
  – all-in/all-out
    • health advantages
    • phase feeding
    • facility utilization
    • avoid weekends/holidays

Interval from PGF2-alpha to First Pig

Gall and Day, 1987

Farrowing Distribution by PGF2-alpha dose

Gall and Day, 1987

Response to topical vaginal mucosal Lutalyse application once or twice daily on d113 (and control).……

Response to vulvar mucosal injections of Lutalyse once or twice daily on d113 (and control). No treatment effect on litter parameters, number stillborn, survival, d12 weights. One or two injections equally effective.

Straw et al., 2005

Straw et al., 2005
Reasons to Induce

• Reduced hours of group farrowing (24 hours)
  – >20% stillborn and neonatal mortality
  – attend farrowing
    • remove placental membranes
    • proper environment
    • colostrum
    • avoid crushing
    – schedule labor
    – obstetrical assistance

<table>
<thead>
<tr>
<th>Measure (Per Litter)</th>
<th>Number</th>
<th>Std. Error</th>
<th>Percent</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mummified per litter</td>
<td>0.25</td>
<td>0.207</td>
<td>0.5</td>
<td>0.04</td>
</tr>
<tr>
<td>Piglets weaned per litter</td>
<td>10.02</td>
<td>0.571</td>
<td>10.72</td>
<td>9.31</td>
</tr>
<tr>
<td>% Total losses of liveborn</td>
<td>12.19</td>
<td>3.267</td>
<td>15.94</td>
<td>8.53</td>
</tr>
</tbody>
</table>

On average, large and medium sites had approximately one more piglet born alive per litter than small sites. Large sites also averaged about one more weaned piglet per litter than small sites.

Value of Lost Pigs

• Piglet born value $13.50 (NSIF)
• Weaned pig value $33.00 (Dhuyvetter)
• 11,462,000 litters born (USDA)
• 0.87 liveborn piglets not weaned

11,462,000 x 0.87 x $13.50 = $134,621,190
11,462,000 x 0.87 x $33.00 = $329,074,020

Predisposing Conditions

• Small birthweight
• Prolonged delivery
  • Hypoxia
• Cool environment
• Scours (dehydration)
Supervision Allows.....

- removal of placental membranes
- assurance that piglets get warm and dry
- assurance that piglets get colostrum
- fostering
- reduction of crushing
- prevention of savaging
- obstetrical assistance

Thermal Environment

- uterine to extra-uterine = 5-45 °F drop
- high and narrow TNZ
  - LCT = 94°F at birth
  - = 86°F 48h after birth
  - = 77°F by one week of age
- lightweight = high surface area:volume

Disease

- immunologically immature
- colostral IgG
  - most efficient 12 hours postnatal
  - by 48 hours gut closure complete
  - 50% decline in colostrum within 6h of first nursing
- IgG have 14d half-life
- IgA protects gastrointestinal tract
- sick pigs seek heat and move slowly

Response to PGF2-alpha + oxytocin

![Response Graph](image)

- control
- PGF2-alpha
- PGF2-alpha + oxyt 24h
- PGF2-alpha + oxyt 20h

Holtz et al., 1983

Cassar et al., 2005 similar results:

- Lutalyse 1x
- Lut1x+oxytocin
- Lut 2x
- Lut 2x+oxytocin

Interval to farrowing:

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Interval to Farrowing (hrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>25.8±2.3</td>
</tr>
<tr>
<td>PGF2-alpha</td>
<td>24±0.8</td>
</tr>
<tr>
<td>Lut1x+oxytocin</td>
<td>26.3±1.1</td>
</tr>
<tr>
<td>Lut 2x+oxytocin</td>
<td>24.8±0.8</td>
</tr>
</tbody>
</table>

Cassar et al., 2005 similar results.
When Induction Gets a Bad Rap

- reported to increase morbidity
  - ~8% vs ~16% (d114 induction) (Gunvaldsen et al., 2007)
- reported to decrease growth
- reports of increased splaylegs
  - ~0.7% vs 0.3% (d112 induction) (Bolcskei et al., 1996)
- if induced too early, pigs not viable
- non-induced gestation length must be known!

<table>
<thead>
<tr>
<th>Type of Death</th>
<th>Supervised</th>
<th>Unsupervised</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trauma</td>
<td>10^4</td>
<td>10^3</td>
<td>.009</td>
</tr>
<tr>
<td>Low viability</td>
<td>10^4</td>
<td>10^3</td>
<td>.003</td>
</tr>
<tr>
<td>Miscarriage</td>
<td>10^3</td>
<td>10^2</td>
<td>.046</td>
</tr>
<tr>
<td>Deformation</td>
<td>10^2</td>
<td>10^2</td>
<td>.027</td>
</tr>
<tr>
<td>Unknown</td>
<td>5</td>
<td>2</td>
<td>.23</td>
</tr>
<tr>
<td>Total</td>
<td>106</td>
<td>105</td>
<td></td>
</tr>
</tbody>
</table>

*Numbers in a row with different superscripts differ by at least P < .05.

• 472 sows induced d113, 114 or 116
• Most d116 sows farrowed spontaneously
• No effect on # born alive, stillborn, morbidity, growth, splay leg or WEI
• Increase in pre-wean death in d113

Less than 4% stillborn
Less than 4% prewean mortality

Supervision of farrowing......
Conclusions

- Know non-induced gestation length
  - induce not more than two days early
- Choose appropriate induction protocol
  - reduce number of days or timing within day
- Be aware of action of prostaglandins on non-target species (implications for humans - reproductive and respiratory)