Genomic Selection for Improved Fertility of Dairy Cows with Emphasis on Cyclicity and Pregnancy

Association of Genomic Selection with Culling and Replacements


US Trends: +270 lbs Cow/yr (or ~1%)
What are the Three Largest Expenses of a Dairy Business?

- Feed for lactating dairy cows
- Raising replacement heifers
- Labor

What is the Largest Expense of a Heifer Raising Operation?

- Feed
What Determines Days on Feed?

Age at Calving; which is determined by:
- Nutrition management
- Growth (ADG) & development
- Conception
- ...

Transition Cow Program

Basic Physiological Functions to Avoid Transition Cow Diseases

- Resting time (h/d)
- Dry matter intake and adaptation of the rumen to lactation diets (ketosis)
- Maintenance of normocalcemia
- Maintenance of a strong immune system

Determine the Prevalence of both metabolic and infectious diseases
Serum Ca within 48 h after Calving

Fig. 1. Serum calcium concentrations were plotted for 1402 cows. All serum samples were collected within 48 h postpartum by location number: 1st lactation cows (n = 454), 2nd lactation cows (n = 447), 3rd lactation cows (n = 295), 4th lactation cows (n = 186), 5th lactation cows (n = 72), and 6th lactation cows (n = 32). The percent of cows by location number that experienced a clinical milk fever episode which was treated or were subclinically hypocalcemic are shown in the graph.

Variation in Dairy Herd Performance (DMRS 2013; 8,211 herds)

~ 26% of Variation in PR is Due to Management/Environment

Top 10% Culling: 18%-43%

Bottom 10% ~ 8%

Estrus

Virtual Herd

Cow Record

(attributes and daily status)
Economics of Transition Cow Management

<table>
<thead>
<tr>
<th>1000-cow herd</th>
<th>Culling within 60 DIM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Items</strong></td>
<td><strong>6%</strong></td>
</tr>
<tr>
<td>Pregnant, %</td>
<td>603.00</td>
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<tr>
<td>Lactating, %</td>
<td>855.00</td>
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<tr>
<td>Milk, kg/d</td>
<td>29.30</td>
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<tr>
<td>Milk sales, $</td>
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<tr>
<td>Cow sales, $</td>
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<tr>
<td>Calf sales, $</td>
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<tr>
<td>Replace costs, $</td>
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<tr>
<td>Breeding costs, $</td>
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<td>Feeding costs, $</td>
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<tr>
<td>Other costs, $</td>
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<td>Profit, $/d</td>
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<tr>
<td>Profit, $/yr</td>
<td>$80,300.00</td>
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</tbody>
</table>

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For Each Unit of Culling Increment:
- Milk Yield Decreased 13.24 kg/cow/yr
- Replacement Costs Increased 48.15 $/day

For 1000-Cow Herd with ≥ 30% Culling,
Losses ($) May Offset the Milk Genetic Progress (~1% per Yr)

20 Lbs of Colostrum: 11 Mcal of energy, 140 g of protein, 23 g of calcium, 9 g of phosphorus, and 1 g of magnesium

Ca loss in Colostrum is 10-15x Higher than in Blood (~4 g)

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Calcium Status of Dams at Calving is Associated with Calf Diarrhea

Risk Factors for Lifetime Performance of Replacements:
- Each unit of calving difficulty: -195 kg ($P=0.05$)
- Weaning Age: -463 kg ($P=0.02$)
- Days ill: -126 kg ($P<0.01$)
- Wean DMI (for every 1 kg DM): +286 kg ($P=0.02$)

Lactating Cows: Final Remarks
- Milk yield increases as lactating cows age (2nd and 3rd lactations); BUT older cows are at greater risk for transition diseases
- Culling offers an opportunity to replace unproductive animals, BUT ≥ 30% culling may offset the milk genetic progress
Replacement Heifers: Final Remarks

- Events (dystocia, diarrhea, days treated, and ADG) within the first 2-months of life (weaning) reduce first-lactation and lifetime milk production.
- Genomic selection offers an opportunity to select superior replacements, BUT “management” early in life determines the lifetime performance regardless of genetic merit.

Health is KEY for Milk and Reproduction

- Can I select for those “traits” that best address the challenges of transition cows without compromising MILK?
- If I can select for those “traits”, what do I need to do from a management standpoint to capture the economic benefits of those “traits”?
- ...

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THANK YOU!