Breed differences in postpartum cyclicity and fertility of pasture-based dairy cows

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Introduction

It has been reported that early cyclicity in pasture-based dairy cows is associated with higher fertility, and increases the likelihood of an earlier insemination. Higher genetic merit cows have been shown to have a greater risk for reproductive failure due to their selection for greater production. There is high correlation between yield traits and return to luteal activity. There has also been increasing interest in crossbreeding in US dairy herds in recent years due to concerns regarding female fertility, calving ease, health, and the survival of Holsteins; and because of increasing inbreeding levels within all major dairy breeds.

Materials and Methods

During the fall calving season in 2005, 150 cows were sampled at the Center for Environmental Farming systems Dairy unit in Goldsboro, North Carolina of which 46 were Holstein, 50 were Jersey, and 54 were various Holstein and Jersey crossbreds.

The varying crossbreds were created using a criss-cross breeding program designed by Dr. Ben McDaniel of NC State University that has previously been described in these proceedings. By implementing this breeding design, the following breed make up of crossbreds was used in this study: 28 half Holstein/Jersey, 6- ¼ Holstein, 13- ¾ Holstein, 6- 5/8 Holstein and 1- 3/8 Holstein, for an average breed make-up of 54.4% Holstein.

A portion of the cows in this study were part of an ongoing trial involving the effects of high and low stocking rates. The High stocking rate was 3.7 cows/ha or 1.5 cows/acre with 1.5x supplementation of 12 to 24 pounds of concentrate per head per day. The Low stocking rate was 2.5 cows/ha or 1cow/acre with 1x supplementation of 8 to 16 pounds of concentrate per head per day. Amounts of concentrate varied depending on quantities and quality of pasture or round bale haylage (fed when pasture was limited or unavailable) and consisted of ground corn, whole cottonseed, soybean meal, and minerals. When lush pasture was available the relative proportion of soybean meal in the supplement was reduced as were total amounts of concentrate. There were also cows included in this study that were not part of the stocking rate trial. Those cows received pasture plus a corn silage-based TMR during late fall and winter.

Milk production per cow was measured on monthly test days. Body weights were taken at dry off, calving, and monthly thereafter for all cows. Milk samples were collected from late October to beginning of February twice weekly. Samples were taken during the PM milking of volumes at least 25mL per sample. All samples were centrifuged to obtain the skim milk portion which was stored frozen until analysis for progesterone concentrations. Analysis consisted of a Coat-a-Count radioimmunoassay with Iodine-125 labeled progesterone. A gamma counter was used to obtain progesterone concentration of the samples, and a positive control was used from a known pregnant cow.

Return to cyclicity was defined for this study as the 1st time P4 levels were at least 1 ng/mL for 2 consecutive samples or 2ng/ml for one. Length of Anestrous was calculated for cyclic cows only as the length from calving until the 1st day P4 levels were at least 1 ng/mL.
**Results**

Stocking rates did not have a significant effect on postpartum intervals to first ovulation, body weight, or production. There was also no interaction of stocking rate with breed effect on anestrous interval, body weight, or production.

Figure 1 illustrates the changes in mean body weight by breed at dry-off, calving, 30, and 60d postpartum. Jerseys weighed significantly less than either Holsteins or Crossbreds at all intervals. Also, Holsteins had more pronounced weight changes over the intervals than the Jerseys or crossbreds.

Milk production by breed in lbs/day at 30, 60, and 90 days postpartum is shown in Table 1. The Holsteins produced the most and the Jerseys the least, as was expected. Crossbred cows were intermediate to both pure breeds.

**Table 1. Milk Production by Breed in lbs/d ± S.E.**

<table>
<thead>
<tr>
<th>Breed</th>
<th>30d</th>
<th>60d</th>
<th>90d</th>
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<tbody>
<tr>
<td>Holstein</td>
<td>56.1 ± 3.1</td>
<td>52.8 ± 2.6</td>
<td>51.9 ± 2.9</td>
</tr>
<tr>
<td>Jersey</td>
<td>45.5 ± 2.9</td>
<td>42.7 ± 2.6</td>
<td>39.4 ± 2.9</td>
</tr>
<tr>
<td>Crossbreds</td>
<td>49.5 ± 2.9</td>
<td>46.2 ± 2.6</td>
<td>51.0 ± 2.9</td>
</tr>
</tbody>
</table>

Percentages of cow cyclic by breed at 30, 60, and 90 days postpartum are represented in Figure 2. At 30d, 22% of Holsteins, and 43% of Jerseys and Crossbreds were cycling. At
60d, percentage cycling increases to 59% for Holsteins, 94% for Jerseys, and 85% for Crossbreds. By 90d postpartum, only 77% of Holsteins had initiated cycles compared to 97% of Jerseys and 100% of crossbred cows.

No significant differences were found in mean anestrous intervals among breeds. The means for estimated days to first ovulation for each breed are as follows: 35.8 ± 2.8d for Holsteins, 31.2±2.1d for Jerseys, and 33.7±1.9d for Crossbreds. However, because anestrous intervals were calculated only for cows that were cyclic by 90d postpartum, we expect the interval to first ovulation for Holsteins will be higher when the other 23% become cyclic.

In Figure 3, conception and pregnancy rates by breeds are shown with conception rate for 1st service and pregnancy rate at 90d of breeding. For 1st service, Holsteins had a 34% conception rate while the Jerseys were at 61% and Crossbreds at 54%. By 90d of breeding, 59% of Holsteins and 84% of Jerseys and Crossbreds were confirmed pregnant.

Discussion

Breed differences in postpartum cyclicity were evident in this study. Fewer Holsteins initiated estrous cycles when compared to Jerseys and Crossbreds at 30, 60 and 90d postpartum. Also, Holsteins had lower conception and pregnancy rates compared to Jerseys and Crossbreds.

Crossbreds were intermediate to the purebreds for production and body weight, but were similar to Jerseys regarding reproductive measures. More analyses are needed, however, to determine the relative merits of crossbred dairy cows in various systems.

Note that the Jersey cows that calved in 2005 had numerically higher first service conception rate than crossbred cows whereas in the 3-year stocking rate study reported elsewhere in these proceedings, the crossbred cows were numerically higher than Jerseys. Part of that difference is associated with the relatively low conception rate for Jerseys calving in 2003. Most of those cows calved in a confinement TMR system and were moved and had to adapt to the pasture system after calving.
Figure 3. Conception at 1st service and Pregnancy Rates by Breed.