Pregnancy Rates in Natural Service and Artificially Inseminated Dairy Herds

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Overview

• Use of AI vs. NS bulls
• Reproductive efficiency
  - Florida study
  - Other studies
• Other considerations
Use of natural service (NS) bulls on cows

- Florida survey (1984): 50% of dairies use mostly AI, 12% mostly NS bulls, 38% mixture (Chenoweth and Larson, 1992)

- National survey (2002): “Most (55%) operations used bulls as a component of their breeding program and 89% of these bulls were dairy bulls” (NAHMS, 2002)

- Eastern US (2002): 26% use only AI, 62% use some bulls, 12% use mostly bulls (Smith et al., 2004)
Use of natural service (NS) bulls on heifers

- **Pennsylvania survey (1987)** (Heinrichs et al., 1987)
  - 329 Pennsylvania dairy farms
  - 11.2% of heifers bred 1x by AI, then by NS bull
  - 8.5% of heifers bred 2x by AI, then by NS bull
  - 20.7% of heifers bred by NS bulls only

- **1997 Hoard’s Dairyman continuing market study**
  - 50% of dairies use a bull for breeding dairy heifers
  - 42% of dairies use a bull for breeding cows
Motivation for use of NS bulls

• “Bull does better job detecting heats”
  - Lack of well trained personnel
  - Perception is that reproductive performance may improve because more cows are detected in estrus and serviced (Risco, 2000)

• “Bulls are cheaper”
• “Bulls are genetically adequate”
• Replacement heifers are purchased
Florida study: Overview

de Vries, Steenholdt, Risco, 2004

1. Calculate pregnancy rates in DHIA herds
2. Determine if herds use AI, bulls (natural service; NS) or both (mixed)
3. Compare pregnancy rates in AI, NS, mixed herds

Accepted in Journal of Dairy Science
Cow Data

- DHIA Lactation records
  - 8 years: 1995-2003, herds located in FL + GA
  - 2 seasons: Winter (November - April) Summer (May - October)
  - 8 x 2 = 16 periods
  - Pregnancy rates calculated per herd, per season (16 periods maximum per herd)
Pregnancy rate

= \#\text{ cows pregnant} / \#\text{ cows eligible to get pregnant, in a 21-day period} \\
\sim\text{heat detection rate} \times \text{conception rate}

E.g. 50\% \times 40\% = 20\% pregnancy rate

<table>
<thead>
<tr>
<th>DIM</th>
<th>#Eligible</th>
<th>#Observed</th>
<th>%Obs</th>
<th>#Eligible</th>
<th>#Reported</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1--28</td>
<td>18</td>
<td>18</td>
<td>100</td>
<td>0</td>
<td>0</td>
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<tr>
<td>29--49</td>
<td>53</td>
<td>42</td>
<td>79</td>
<td>4</td>
<td>1</td>
<td>25</td>
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<td>50--70</td>
<td>116</td>
<td>72</td>
<td>62</td>
<td>49</td>
<td>11</td>
<td>22</td>
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<tr>
<td>71--91</td>
<td>250</td>
<td>159</td>
<td>64</td>
<td></td>
<td></td>
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<tr>
<td>92--112</td>
<td>230</td>
<td>62</td>
<td>27</td>
<td>182</td>
<td>18</td>
<td>10</td>
</tr>
<tr>
<td>113--133</td>
<td>223</td>
<td>82</td>
<td>37</td>
<td>178</td>
<td>19</td>
<td>11</td>
</tr>
<tr>
<td>134--154</td>
<td>203</td>
<td>99</td>
<td>49</td>
<td>166</td>
<td>28</td>
<td>17</td>
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<tr>
<td>155--175</td>
<td>174</td>
<td>67</td>
<td>39</td>
<td>151</td>
<td>13</td>
<td>9</td>
</tr>
<tr>
<td>176--196</td>
<td>165</td>
<td>79</td>
<td>48</td>
<td>144</td>
<td>20</td>
<td>14</td>
</tr>
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<td>197--217</td>
<td>146</td>
<td>58</td>
<td>40</td>
<td>120</td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td>218--238</td>
<td>124</td>
<td>43</td>
<td>35</td>
<td>97</td>
<td>11</td>
<td>11</td>
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<tr>
<td>239--259</td>
<td>104</td>
<td>32</td>
<td>31</td>
<td>68</td>
<td>4</td>
<td>6</td>
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</table>
Herd Data

• DHI Herd Summary 202 records
  - Genetic profile of service sires

  - % OF HERD BRED TO
    • Proven AI sires: → AI bred
    • Al young sires: → AI bred
    • All other sires: → Natural Service (bull bred)
Results

488 herds
4872 herd-periods
Effect of lactation number

Breeding system

Pregnancy rate (%)

Winter Summer

AI Mixed NS AI Mixed NS

Winter
Summer

Pregnancy rate (%)

AI Mixed NS AI Mixed NS

Breeding system

All
Lact 1
Lact 2+
Effect of stage of lactation

Pregnancy rate (%)

Days after calving

- AI, winter
- Mixed, winter
- NS, winter
- AI, summer
- Mixed, summer
- NS, summer
The change in milk production from year to year was not significantly different between the AI, mixed, and NS breeding systems.
Other studies (I)

- 96 Australian herds (1973, 1974), (Williamson et al., 1978)
  - Some herds used only AI, some used only NS, some used a mixture.
  - Conception rates of cows bred by AI or NS were not different (both 58%).
  - Conception rates in herds that used NS bulls were more variable.
Other studies (II)

• **3 herds in California** *(Niles et al., 2002)*
  - NS bulls used as “clean up” bulls (cows open = 110 to 130 days in lactation)
  - Pregnancy rates (%):

<table>
<thead>
<tr>
<th>Season</th>
<th>AI</th>
<th>NS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter</td>
<td>18.3 ± 1.8</td>
<td>23.2 ± 1.8</td>
</tr>
<tr>
<td>Spring</td>
<td>22.1 ± 2.1</td>
<td>23.2 ± 2.1</td>
</tr>
<tr>
<td>Summer</td>
<td>14.8 ± 1.5</td>
<td>14.5 ± 1.5</td>
</tr>
<tr>
<td>Fall</td>
<td>22.3 ± 2.1</td>
<td>21.2 ± 2.1</td>
</tr>
</tbody>
</table>

- Differences not significant.
Other studies (III)

- Eastern US DHI Summary Reports (Smith et al., 2004)
- Breeding system determined from genetic profile of service sires

<table>
<thead>
<tr>
<th></th>
<th>AI</th>
<th>Mostly AI</th>
<th>Mostly NS</th>
<th>NS</th>
<th>SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calving interval (months)</td>
<td>14.1</td>
<td>14.2</td>
<td>14.3</td>
<td>13.5</td>
<td>0.02</td>
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<tr>
<td>Days dry</td>
<td>65.1</td>
<td>67.1</td>
<td>68.9</td>
<td>68.8</td>
<td>0.16</td>
</tr>
<tr>
<td>% Dry 40 to 70 days</td>
<td>70.3</td>
<td>67.2</td>
<td>59.5</td>
<td>49.9</td>
<td>0.26</td>
</tr>
<tr>
<td>% Dry &gt; 70 days</td>
<td>22.6</td>
<td>25.3</td>
<td>30.3</td>
<td>34.8</td>
<td>0.22</td>
</tr>
<tr>
<td>% Dry &lt; 40 days</td>
<td>7.2</td>
<td>7.6</td>
<td>10.3</td>
<td>15.3</td>
<td>0.17</td>
</tr>
<tr>
<td>% Cows leaving herd</td>
<td>34.3</td>
<td>34.4</td>
<td>34.2</td>
<td>33.4</td>
<td>0.18</td>
</tr>
<tr>
<td>% Left for repro reasons</td>
<td>7.6</td>
<td>7.0</td>
<td>6.4</td>
<td>5.5</td>
<td>0.09</td>
</tr>
<tr>
<td>% cows in milk</td>
<td>87.5</td>
<td>87.0</td>
<td>86.4</td>
<td>85.0</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Different colors in a row indicate statistical significant differences (P < 0.05)
Conclusions

• In FL and GA, pregnancy rates in the winter were twice as great as in the summer.
• No meaningful differences between the AI, NS and mixed breeding systems in either season.
• Natural-service herds produced less milk, but the change in milk production was not significantly different from the other breeding systems.
Other Considerations

• Number of bulls (~1:25)
• Feed cost (~$2 / day)
• Health care (breeding soundness exam, vaccinations)
• Extra facilities needed
• Danger
  “To my knowledge no one has ever been killed by an AI technician”
  - unknown
Thank you!