Genetic trends in gestation length

Katarzyna Stachowicz, Ee Cheng Ooi, Peter Amer

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Thank you!

Countries that provided data:
1. Australia
2. Czech Republic
3. Ireland
4. Italy
5. The Netherlands
6. New Zealand
7. Norway
8. Poland
9. Switzerland
10. United States
Why?

Gestation length [days]

Year of birth

NZL
Why?

The graph shows the change in gestation length [days] from 1980 to 2022, with two lines representing different countries: NZL (red) and IRL (blue). The gestation length decreases over time, indicating a trend towards shorter gestation periods. The graph includes years from 1980 to 2022 on the x-axis and gestation length values from 0.5 to -4.5 on the y-axis.
Why?

Gestation length [days] vs Year of birth for POL, NZL, and IRL.
Why?
Genetic trends in GL

Year of birth

Gestation length [days]


POL NZL NDL IRL

abacusbio
Genetic trends in GL

Gestation length [days]

Year of birth


POL NZL NDL IRL

abacusbio.
Genetic trends in GL

Gestation length [days]

Year of birth


POL  NZL  NDL  USA_F  USA_M  IRL

abacusbio.
Genetic trends in GL

Gestation length [days] vs Year of birth for different countries:
- POL
- NZL
- NDL
- USA_F
- USA_M
- CZE
- IRL
Genetic trends in GL

Year of birth

-6.5 -6.0 -5.5 -5.0 -4.5 -4.0 -3.5 -3.0 -2.5 -2.0 -1.5 -1.0 -0.5 0.0 0.5

Genetic trends in GL

Year of birth

Gestation length [days]


POL NZL NDL USA_F USA_M CZE CHE IRL NOR ITA
Genetic trends in GL
Genomic Regions Associated With Gestation Length Detected Using Whole-Genome Sequence Data Differ Between Dairy and Beef Cattle

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Genomics? [ITA]
Tool to manage cows’ fertility

Short gestation length semen
Boost profits with a shorter calving period and more days in milk. Our teams of selectively bred bulls will reduce gestation length by up to 10 days.

They’re a cost-effective alternative to natural mating bulls in weeks 7 to 10.

Benefits of short gestation length semen

Get cows in-calf in late mating.

SGL semen gives you:

- a more condensed calving spread
- more days in milk – and more profit
- more time for cows to recover.

Gestation Length ABV

**Summary**

The Gestation Length ABV allows farmers to identify bulls and cows whose calves will be born earlier than their expected due date. Using shorter gestation length bulls, especially in late calved cows, can increase days in milk and improve fertility by allowing the cow to have more time between calving and joining.

Every joining is an opportunity to make genetic gain. Select bulls from the Good Bulls Guide that meet your breeding objective. In situations where it is desirable to have a shorter gestation length, select Good Bulls with a Gestation Length ABV below 0.

To decrease Gestation Length in a herd, use genomic testing to select females with a Gestation Length ABV below 0.
Correlations with other traits

Gestation length in Danish Holsteins has weak genetic associations with stillbirth, calving difficulty, and calf size

M. Hansen a,b,c, M.S. Lund d, J. Pedersen b, L.G. Christensen c

<table>
<thead>
<tr>
<th>Genetic correlations with GL (ITA)</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Milk</td>
<td>-0.39</td>
</tr>
<tr>
<td>Fat</td>
<td>-0.34</td>
</tr>
<tr>
<td>Protein</td>
<td>-0.50</td>
</tr>
<tr>
<td>Calving ease</td>
<td>-0.49</td>
</tr>
<tr>
<td>Longevity</td>
<td>-0.25</td>
</tr>
<tr>
<td>Age at first calving</td>
<td>-0.42</td>
</tr>
<tr>
<td>Stillbirth</td>
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Correlations with other traits

Gestation length in Danish Holsteins has weak genetic associations with stillbirth, calving difficulty, and calf size.

Genetic correlations with GL (ITA)

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EBV correlations (NZL)

<table>
<thead>
<tr>
<th>Trait</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breeding Worth (Index)</td>
<td>-0.54</td>
</tr>
<tr>
<td>Fat</td>
<td>-0.50</td>
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<tr>
<td>Protein</td>
<td>-0.43</td>
</tr>
<tr>
<td>Milk</td>
<td>-0.25</td>
</tr>
<tr>
<td>Fat %</td>
<td>-0.11</td>
</tr>
<tr>
<td>Protein %</td>
<td>-0.23</td>
</tr>
<tr>
<td>Somatic Cell</td>
<td>-0.19</td>
</tr>
<tr>
<td>Fertility</td>
<td>-0.14</td>
</tr>
<tr>
<td>Functional Survival</td>
<td>-0.23</td>
</tr>
<tr>
<td>Heifer Calving Difficulty</td>
<td>0.01</td>
</tr>
<tr>
<td>Cow Calving Difficulty</td>
<td>0.07</td>
</tr>
<tr>
<td>Body Condition Score</td>
<td>-0.05</td>
</tr>
<tr>
<td>Liveweight</td>
<td>-0.06</td>
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<tr>
<td>Overall Opinion</td>
<td>-0.37</td>
</tr>
<tr>
<td>Stature</td>
<td>-0.04</td>
</tr>
<tr>
<td>Capacity</td>
<td>-0.27</td>
</tr>
<tr>
<td>Legs</td>
<td>-0.08</td>
</tr>
<tr>
<td>Udder Overall</td>
<td>-0.21</td>
</tr>
<tr>
<td>Dairy Conformation</td>
<td>-0.31</td>
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Both short and long gestation length animals produced significantly less milk and solids relative to intermediate-gestation-length cows, after adjusting for the day of the year they were born. However, for short gestation length cows, this effect disappeared when the earlier birth advantage was retained. Short gestation length cows did not exhibit a significant reduction in survival compared with intermediate gestation length cows. Short gestation length did not affect calving difficulty, but long gestation length was negatively associated with this trait. Calves gestated for shorter or longer periods were more likely to die in the perinatal period than other calves (3 and 7% higher incidence of mortality, respectively). Overall, the net effects of shortened gestation lengths are likely to be economically positive.
Several genetic and environmental factors can help improve prediction of calving date, but most improvement requires documented data on breed, parity, age, conception month, DIM, milk yield, service sire, cow sire, and evidence of impending multiple births. **Intentional selection for either shorter or longer GL without consideration of other dependent traits** (e.g., calving ease and stillbirth) is not recommended without additional research.

Knowledge of which environmental and genetic factors impact GL should lead to improved performance of US dairy cattle. (...) More accurate predictions of GL also can assist managers in meeting targeted lengths for dry periods. **Future research can determine and clarify relationships of GL with dystocia, stillbirth, and other health traits as data for those traits become more available through improved recording.**
Final remarks

- Decreasing genetic trends
- Indirect selection pressure (through fertility?)
- Has significant economic value
- NZL – plans on introducing fertility trait independent from GL and including GL in the index with non-linear weighting
- Worth monitoring
- MACE evaluations?
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