

2004 TAIWAN INTERNATIONAL SCIENCE FAIR

CATEGORY : Biochemistry

PROJECT : Waits and Measures

AWARDS : Biochemistry Third Award

**SCHOOL : Queen Charlotte Islands Secondary
School**

FINALISTS : Jamie Richardson

COUNTRY : Canada

‘Waits & Measures’

Science fair project 2003

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Grade 9

Background

Successful calving is measured by the safe delivery of a healthy calf. Any factors that cause dystocia (difficult calving) are undesirable; as it will result in weak or dead calves, stress dams and a decrease in profit to the rancher. The most often identified reason for dystocia are calves that are too large at birth. Ranchers frequently use sires that will result in calves with small birth weights that will be born easy. This is especially true when breeding first calving heifers. The selection for small calves at birth results not only in less growth in the uterus but also less growth after birth, which means less beef to sell. This means ranchers try to balance reasonable growth and reasonable calf size when selecting their sires. Much data has been published on birth weight and its selection.

At our ranch we have often noted that some cows seem to go passed their due date and often then have a large calf. We have used various gestation charts and wheels to estimate the due dates of our cows. These charts tend to be either 282 or 284-day charts.

I decided to calculate the actual gestation length observed in our herd by analyzing historical data from the Richardson Ranch herd book. Only data that recorded the breeding information and birth weight of registered Hereford cows is included in this data set. To qualify the breeding service was either Artificial Insemination or an observed breeding by the herd bull. No birth information that resulted from an unrecorded breeding date is included.

As members of the Canadian Hereford Association (CHA) we have recorded our performance data in their Total Herd Enrollment (THE) program. This program helps us identify those animals in our herd, which have superior genetics. This information is useful only within our herd and cannot be compared to performance data in another herd as performance is affected by environment and feed.

Our data is combined in a THE data set from all the Hereford cows in North America each year to generate expected progeny differences, also known as EPD's. These values are a computer projection of the genetic worth of each animal for selected traits and these may be

compared between herds.

Ranchers make extensive use of EPD's for birth weight and calving ease to help select easy calving bulls. The CHA performance program has only collected breeding dates in the last two years. To date no epds have been generated for gestation by the CHA.

I decided to request additional data from the Canadian Hereford Association to increase the accuracy of my calculations by having a larger data set.

Purpose

The purpose of this experiment is to figure out both the gestation length and average birth weight of Hereford cattle. I will also explore the correlation between the gestation period, the birth weight, and the birth weight EPD's (expected progeny differences).

Hypothesis

If there is a correlation between the gestation period and the weight of a newborn Hereford calf, then the selection for lighter birth weight calves should result in a shorter gestation period. If this hypothesis is true then we should also be able to demonstrate a significant correlation between gestation and birth weight EPD's.

Materials

Past and present data of the Richardson Ranch including breeding dates, birth dates, sex, and birth weight of calves.

All records of calving made by Canadian Hereford Breeders on their cattle and recorded with the Canadian Hereford Association in their performance program in 2002 which included breeding dates, birth dates, birth weights and sex of resulting calves.

Procedure:

1. Collect and edit historical data and CHA data base.
2. Graph number of calves born on each possible day of gestation and at each possible birth weight to establish bell curves which will demonstrate average gestation and birth weights.
3. Determine average birth weight for the Hereford breed and break it down by gender.
4. Determine Average, mean, median, and standard deviation for birth weight and gestation.

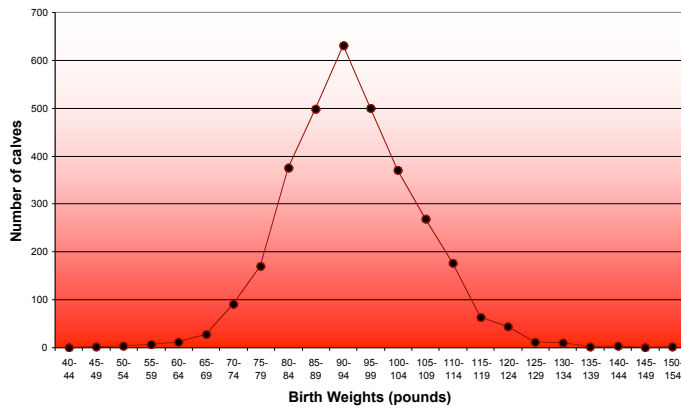
5. Determine if there is a correlation between birth weight and gestation.
6. Determine if selection for birth weights will select for a change in gestation length
7. Compare selected sires birth weights with their epds
8. Determine if sire has more influence on birth weight than gestation

RESULTS

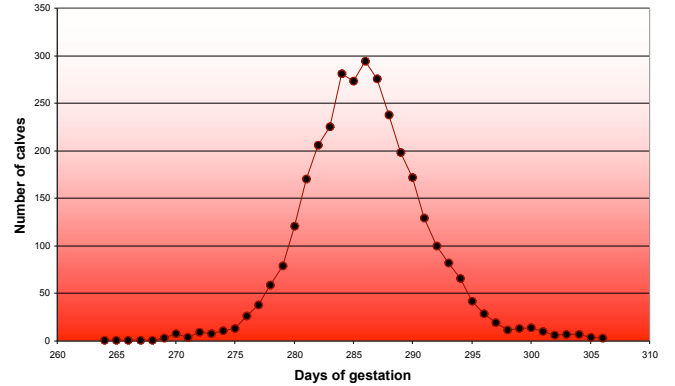
Canadian Hereford Association Results			Richardson Ranch Results		
	Gestation		Birth Wt	Gestation	Birth Wt
Average bull calves	286.42		96.28	285.3	93.5
Standard deviation	5.20		11.37	7.31	14.38
Mean	286		96	286	95
Average heifer calves	285.5		90.53	284.8	89.8
Standard deviation	5.15		11.42	6.42	14.36
Mean	285		90	285	90
Average All calves	285.99		93.46	285	91.6
Standard deviation	5.19		11.75	6.87	14.48
Mean	286		93	286	92

Birth Weight and Gestation distribution curves

Birth Weight of all calves born



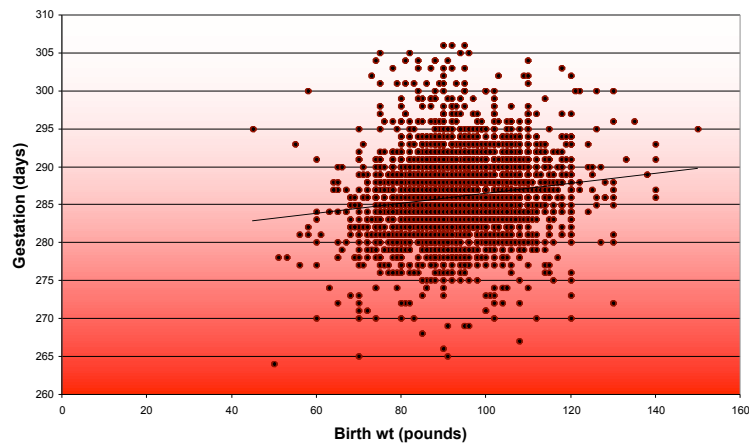
Gestation of all calves born



Correlation of Birth Weight to gestation

All calves birth wt vs gestation

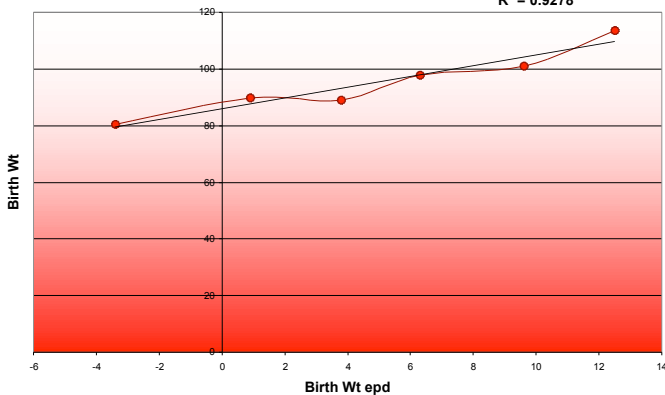
$R^2 = 0.0226$



Correlating Birth Weight EPD to gestation and Birth weight

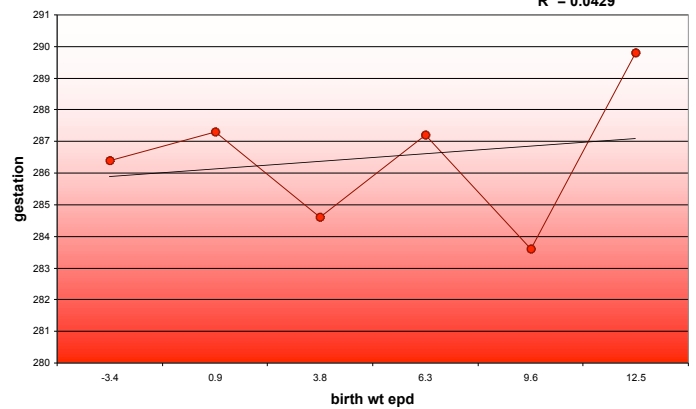
Birth Wt vs Birth Wt epd

$R^2 = 0.9278$



Gestation vs BW epd

$R^2 = 0.0429$



Conclusions

I found that there was no correlation between the birth weight and gestation although there was a very strong correlation between the birth weight and birth weight epd.

Selection for small birth weight calves will not result in any significant change in gestation length.

It is not possible to predict the relative birth weight by the gestation length so if a cow is overdue it does not necessarily imply she will have a large birth weight calf.

Individual sires have more influence on the birth weight of their calves than they do on the gestation length of their calves.

So in conclusion the best tool for selecting calves with small birth weights would be the birth weight epd and not the gestation length.

Acknowledgments

I would like to thank **Val Wells** and **Duncan Porteous** at the **Canadian Hereford Association** for supplying me with the birth weight and gestation data collected by **Canadian Hereford Breeders**. I would also like to thank **Richardson Ranch** for supplying me with their historical data and all the support from **Don Richardson**.

