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Can total protein measurements in newborn calves be used to predict subsequent daily live weight gain?

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Abstract

Introduction:
The calves we produce today are the cows of tomorrow. In order for these calves to achieve their full genetic potential, they must be correctly managed from birth. Initially this involves ensuring adequate passive transfer of maternal antibodies, to protect newborn calves from disease. This study aims to see if calf Total Protein level can predict subsequent daily live weight gain.

Materials and Methods:
52 dairy calves across 3 different farms were blood sampled at <7 days old and Total Protein levels (TP) measured with a refractometer. These calves were subsequently weighed using an animal weigh tape to calculate daily live weight gains (DLWG).

Results:
Farm 1 had an average DLWG of 0.83kg/day. With an average TP of 71.5ug/l
Farm 2 had a DLWG of 0.5kg/day with an average TP of 53.5ug/l
Farm 3 had an average DLWG of 0.63kg/day with an average TP of 63.2ug/l

Discussion:
Although these results are not statistically significant, this study is ongoing and data is still being collected. Results suggest that with a higher TP level, a higher average daily live weight gain is achieved. Based on this data, a TP level >70ug/l is needed to achieve target DLWG (of 0.7kg/d). Further data collection and analysis is needed.

Introduction/Literature Review

The calves we produce today are the cows of tomorrow. For these calves to achieve their full genetic potential, they must be correctly managed from birth.

Rearing heifers efficiently and healthily, will allow them to calve down at an appropriate age and achieve their genetic potential. The current ideas from literature are that heifers should be grown to calve at 85% - 90% of mature body weight or at least 600kg at 24 months old. In order to achieve this they will need an average daily live weight gain of 0.8kg/day.

To give newborn calves the best start in life the first significant step is ensuring adequate colostral transfer. Newborn calves are born with no antibodies. The dam's colostrum is not only a source of nutrition, but also maternal antibodies. These antibodies give the calf protection from disease in early life until its own immune system becomes established.

Measuring passive transfer is important to assess the effectiveness of colostrum management on farms. There are many ways passive transfer can be measured. The most time and cost effective method that can be done in house, is with a blood sample to assess Total Protein levels using a refractometer.

Previous literature has shown Total Protein tests have a sensitivity of 89% and a specificity of 80% compared to the gold standard IgG test. [1] Studies suggest >50ug/l is classed as adequate passive transfer, the higher the value, the better the level of transfer.

Objective

To see if Total Protein level in calves <7 days old can be used to predict daily live weight gain.

Materials and Methods

As part of routine calf health monitoring programmes across 3 farms within the practice, Total Protein levels are regularly collated.

Using plain blood tubes, jugular blood samples were taken from 52 dairy calves, from 3 different farms, in Cumbria. All calves were <7 days old when sampled. The blood samples were left to separate allowing a serum sample to be extracted and then tested on a refractometer. The refractometer is then used to give a level of the Total Protein of the serum (as an indicator for maternal antibody transfer) for each calf.

These calves were subsequently monitored using an animal weigh tape to measure daily live weight gain. They were weighed every 1 -2 weeks until they were weaned off milk.

Weight changes over time were used to calculate average daily live weight gain for each calf.

Discussion

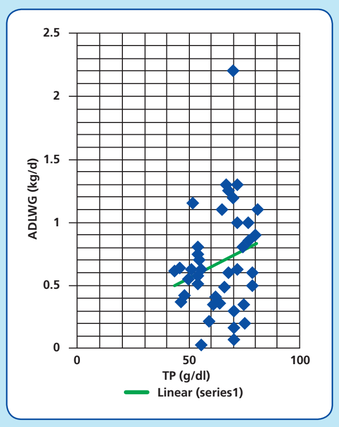
The number of calves tested in this study is too small to be statistically significant. Despite this, the data collected does seem to suggest achieving higher average TP in calves does result in higher average daily live weight gains.

The lack of significance was due to the number of calves included (limited by time/availability of eligible calves). The data collection for this study is still ongoing; results are only published on what we have collected up to date.

The current results show that by striving to achieve good colostral transfer, calves can be given the best start in life, on their way to achieving target live weight gains. This ultimately allows them to calve down at the target age/weight to maximise productivity and efficiency. Regularly monitoring average TP and DLWG are useful as part of calf health protocols, checking farms are on target and maximising their calf health.

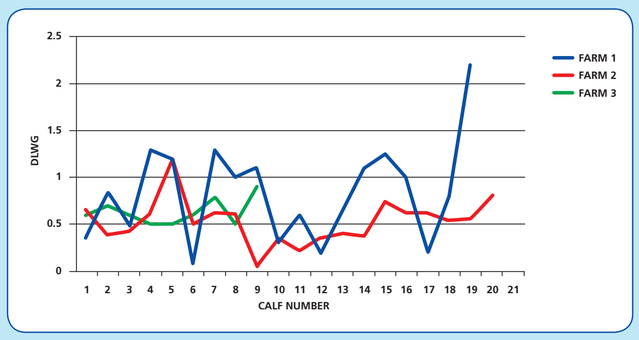
It would be interesting to see in the future if there is any direct correlation with the level of TP and amount of weight gain. It seems that calves need to be getting TP levels above 70ug/l to have live weight gains on target (0.7kg/day). We do plan long-term to follow the heifer calves in this study right through and identify what age/weight they calve down at.

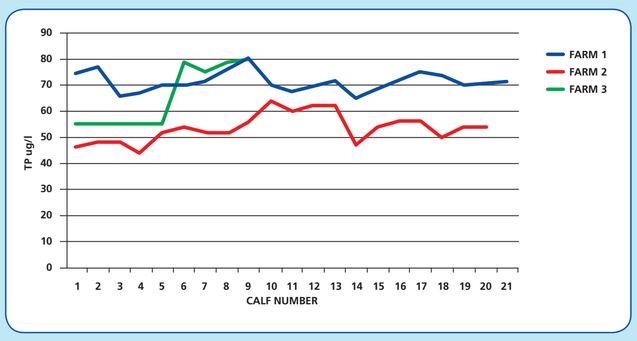
Results



Graph 1: Scatter Plot of DLWG against TP level

Graph 2: Shows Average DLWG for each calf, for each of the 3 farms





Graph 3: Shows TP values for each calf, for each of the 3 farms

This graph shows each of the 3 farms' daily live weight gains for individual calves.
Farm 1 (blue) had an average DLWG of 0.83. With an average TP of 71.5ug/l
Farm 2 (red) had a DLWG of 0.5 with an average TP of 53.5ug/l
Farm 3 (green)had an average DLWG of 0.63 with an average TP of 63.2ug/l
The line of best fit on graph 1 steadily increases as TP increases.

References

1. Johnson, Burn, Wathes, Mouncy Cattle Practice Volume 19 part 3 "Measuring passive transfer in dairy heifers: comparing total protein (TP and radial immunodiffusion methods)"

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