

Condition Score & Fertility

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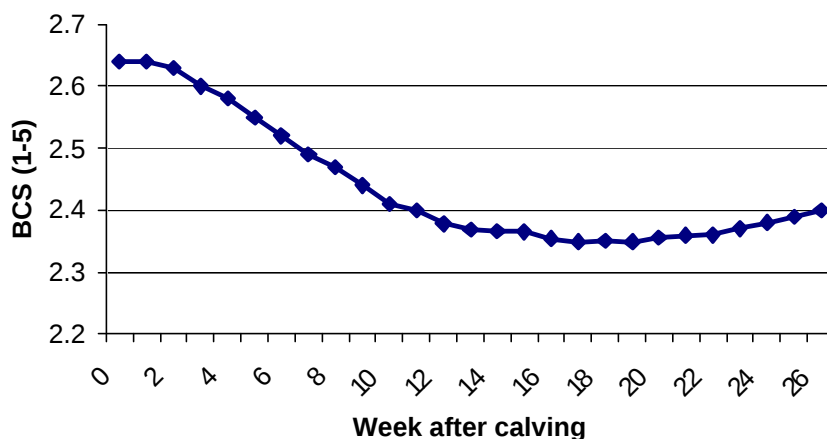
Condition Score and Fertility

In the last article (November 2001 journal), we looked at cows in a range of condition score (CS) and discussed the relationship between the scores that are given and the amount of fat in the cow's body. In this article, we discuss the value of body fat to the cow and how the cow uses body fat to her advantage. We then consider what happens if the mobilisation of body fat becomes extreme, either through management or through breeding, and especially the relationship between CS and fertility.

Mobilising body fat is normal

Most mammals use body fat to 'fuel' milk production, particularly in early lactation. In extreme cases the phenomena of using body fat can account for 50% of the animals body mass e.g. polar bears. However, in dairy cows it is generally between 3% and 10% and that is mostly in the first 70 days after calving. Figure 1 below shows the average change in body condition in the first 26 weeks for first lactation heifers at Langhill.

Figure 1. Average CS by lactation week for 1st lactation heifers at Langhill.



The graph shows that, on average, heifers lose approximately a third of a condition score unit by about week 10 of lactation. From the article in the last issue, showing the relationship between CS and weight of

body fat, we can deduce that this loss equates to about 17 kg of body fat or just under 5% of the body weight of a 500 kg heifer. However, it is important to remember that the graph above shows what happens on average. Individual cows vary around that mean and some can lose considerably more than 17 kg.

Body Condition and Fertility

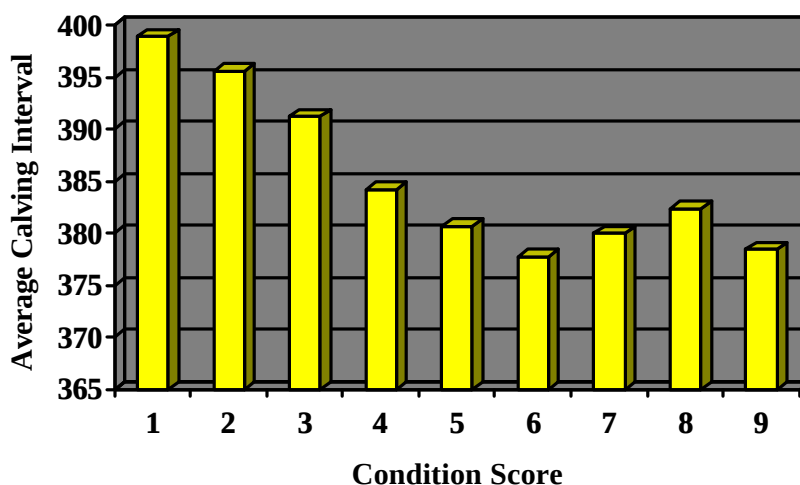
There is now a wealth of research data showing a connection between CS and fertility. This is true for a variety of fertility measures including the interval from calving to commencement of reproductive activity and calving interval. At Langhill there are differences between the genetic lines in both CS and in reproductive success. The select cows are on average thinner and lose more condition after calving than the control cows.

Table 1. Line differences in average CS and CS change

	Select Line	Control Line
Average CS	2.24	2.44
CS change	-0.38	-0.23

Using Holstein UK data collected at classification time, we have shown a clear relationship at the phenotypic level between CS and calving interval (Figure 2).

Figure 2. CS and calving interval (Data source: Holstein UK).



These data are at the phenotypic level. What is the situation at the genetic level? At Langhill we looked at the relationship between CS and fertility both before and after adjusting for milk yield.

The analysis was conducted because it was suggested that thin cows had longer calving intervals simply because they produce more milk. However, the data in table 2 show that thinner cows have longer calving intervals *even after correction for milk yield*. The genetic correlation between CS and reproduction is -0.4 before including for yield and -0.2 after including yield. This implies that yield accounts for some, but not all, of the relationship and that thinner cows at a given milk yield have longer calving intervals.

Table 2. Heritability and genetic correlation between CS and calving interval before and after including yield as an additional trait.

Trait	Heritability	Genetic Correlation
Condition Score	0.28 (0.01)	
Calving Interval	0.02 (0.005)	-0.40 (0.09)
Condition Score (adj. for yield)	0.25 (0.01)	-0.22 (0.10)

The genetic correlation between CS and calving interval provides the incentive to use these traits to produce a fertility index since both these measures are readily available on large numbers of animals and are relatively accurately. This is the subject of current research and will be addressed more fully in a future article.

Body Condition or Body Condition Change?

There has been a lot of discussion regarding the most important aspect of body fat. Previous research has advocated a minimum condition score at calving of around 3 to 3.5 (on a 5 point scale) in the expectation that the cow will lose body fat in the first few weeks of lactation. If she has plenty to start off with, then at peak loss she will still have sufficient to sustain other important functions such as fertility and the immune

system. Some have suggested that it is the rate of body fat loss that is important in relation to fertility. However, it is likely that the two measures are related in that cows fatter at calving lose more body fat.

In a study at Langhill (table 3) looking at the phenotypic relationship between body condition and reproduction, we found that the absolute CS at week 10 had a higher correlation with calving interval than did the rate of CS loss.

Table 3. Phenotypic correlation between Average CS and CS change and two measures of fertility

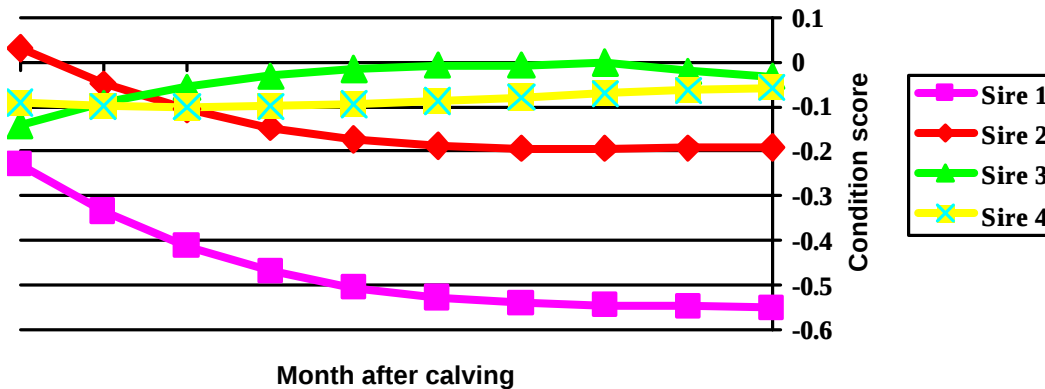
	CS week 10 after calving	CS change week 1 to 10
Days to 1 st heat	-1.3 days	-10.2 days ^{***}
Calving Interval	-11.9 days ^{***}	-5.3 days
Conception to 1 st Service	6%	-19%

However, it is interesting to note that the same table shows that the rate of CS loss is most highly correlated with days to first heat. This indicates the difference between these two economically important fertility traits and that fertility would be best addressed in the longer term by selection on both aspects – cyclicity and conception.

Is Condition Score heritable?

Using a single CS on each daughter of a bull assessed during the routine classification visits, we can construct a profile of CS change throughout the lactation that a typical daughter of that bull would have. This is achieved using a new method of calculation known as Random Regression and relies on the fact that the daughters of a bull are randomly classified at a range of stages of lactation. Whilst some young bulls have many of their daughters classified in a short period e.g. from month 3 to 7 of lactation, many others have them spread right throughout lactation, particularly when they become proven and more heavily used. These bulls provide most of the necessary information that enables CS curves to be calculated. In this analysis, the heritability of CS was around 0.3, which is similar to that of milk yield. In short this tells us that we can select for, and therefore change, the CS of females using bull proofs for CS. You can see from Figure 2 that there are differences between bulls in the shape of their daughter CS losses and gains through lactation.

Figure 2. CS profiles for 4 well known sires.



Summary

In this article we have looked at both Langhill and national Holstein UK data on calving interval and condition score. The relationship is strong and unfavourable. That is, thin cows are less fertile generally. We have also shown that condition score is heritable and that bulls differ in the profile of their daughters' CS change. This may prove useful in the future in selection indices to improve fertility and possibly health traits. Work is continuing at SAC and University of Edinburgh looking at the genetic relationships between CS and linear type traits, between CS and survival and the use of CS in future selection indices

Further Information

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