

The effect of birth date on gestation length in Holstein cows and heifers

This article is on an interesting subject which is worthy of investigation. In herd health management, knowing when to expect a calving is very important. So far, the influence of the month of calving on gestation length was studied only in hot summer months and colder fall months. It was found that cows that calved in August had a shorter gestation than cows that calved in October. It was suggested that a shorter gestation in cattle that calved in summer may be associated with hot ambient temperatures. In other words, it was hypothesized that a hot ambient temperature may accelerate the onset of parturition. However, a more detailed time analysis in the present study showed that cows and heifers have a shorter gestation not only in the case of calving during hot summer months but also during the cooler spring months in the temperate zone. Therefore, some other explanation is needed. The length of the period in which calved cows and heifers had a shorter gestation was almost the same as in which conceived cows and heifers had a shorter gestation approximately 9 months earlier. This similarity indicates that a shorter gestation in dairy cows and heifers that calved from spring to summer may be associated with the conception date.

In the present study, cows and heifers that conceived in the first half of the year tended to have a longer gestation than those that conceived in other months of the year. Photoperiod is the most common environmental factor that affects long-term physiological processes, particularly reproduction. Although cattle are not strictly seasonal breeders such as sheep and horses, there is some support for the suggestion that decreasing photoperiod in the fall may influence gestation length. The effect of photoperiod is mediated by the nocturnal secretion of melatonin from the pineal gland in such a way that melatonin concentrations are high at night and low during the day in cattle. Studies in mice, sheep and cattle have shown that melatonin supports the development of the conceptus. Melatonin receptors have been identified in bovine embryos and the beneficial effects of melatonin on bovine conceptus development are mediated by the melatonin receptor 1. However, decreasing photoperiod in the fall may affect gestation length not only through the direct effect of melatonin on conceptus development, but also through its potential role in the regulation of progesterone production by ovaries. Moreover, it was found that melatonin stimulates progesterone production by bovine granulosa cells in vitro, at concentrations similar to those present during the endogenous nocturnal rise. Furthermore, it was observed that plasma progesterone concentrations in Holstein cows increase and reach higher luteal values in August and November (decreasing daylight) than in April and June (increasing daylight). Several studies showed that elevated concentrations of circulating progesterone shortly after conception are associated with increased conceptus growth in dairy and beef cattle. Moreover, the effect of progesterone on blastocyst development was blocked by administration of RU486, a progesterone receptor antagonist.

In many wild species of bovidae in their natural habitat, the peak of the calving season is in the spring and summer when the climate and food supplies are favorable for the survival and growth of

offspring. In the course of domestication, cattle have been selected to be able to conceive and calve during the whole year. Thus, in modern dairy cattle, calving also occurs in the season that was not so suitable for offspring survival in their wild ancestors. Our results showed that the time period with a shorter gestation in calved cows and heifers corresponds to the calving season in wild species of bovidae. Conversely, the time period with a longer gestation in calved cows and heifers corresponds with the season that was not so hospitable for offspring survival of their wild ancestors. A possible explanation might be that a longer gestation in cows and heifers calved in the winter is a tendency to restore the calving season of cows and heifers to that which is favorable for survival of their offspring.

In conclusion, Holstein cows and heifers calved in the spring and summer had a shorter gestation than those calved in other months of the year. The length of the period in which they had a shorter gestation was nearly the same as in which conceived cows and heifers had a shorter gestation approximately 9 months earlier. Thus, gestation length in calved cows and heifers may be affected by the conception date. Moreover, the period in which conceived cows and heifers had a shorter gestation coincided with the decreasing daylight whereas the period in which they had a longer gestation corresponded with the increasing daylight. This indicates that gestation length in Holstein cattle may be affected by daylight changes during the year in the temperate zone. Further research will be necessary to fully understand environmental effects on gestation length in dairy cattle.

Tomasek R., Rezac P., Havlicek Z.
Mendel University, Czech Republic

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