

Early lactation hyperketonemia impacts whole-lactation milk and reproductive performance in Holstein cattle

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Background

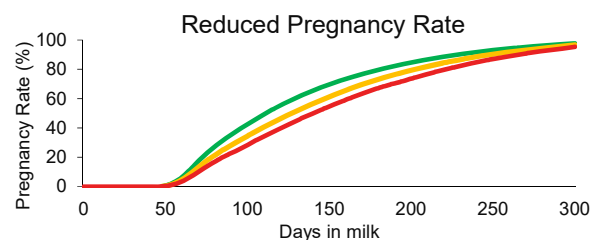
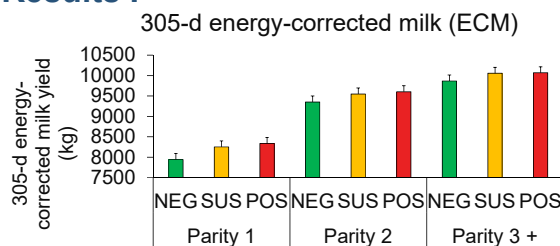
Optimal health and performance is dependent on a successful transition period. However, metabolic diseases, most notably hyperketonemia, characterized by elevated levels of β -hydroxybutyrate (BHB), has a relatively high prevalence of 22% on Canadian farms (Santschi et al., 2016; Tatone et al., 2017). Although levels of BHB have been traditionally measured in blood and urine samples, recent advances have made it possible to reliably measure BHB in milk by FTIR, making it amenable to routine monitoring through regular DHI testing. We have also demonstrated that milk BHB is highly correlated to blood BHB (Denis-Robichaud et al., 2014).

The objective of this study was to identify the consequences of elevated milk BHB on 305-day lactation performance, reproductive success and culling rate. Analysis was also performed according to cow production level.

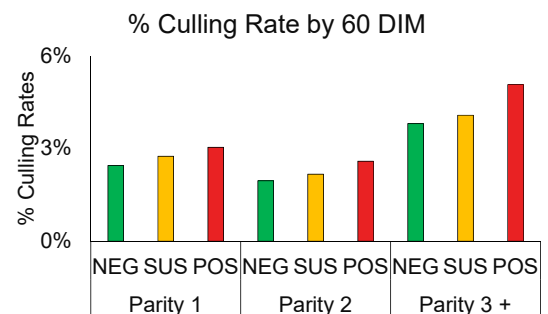
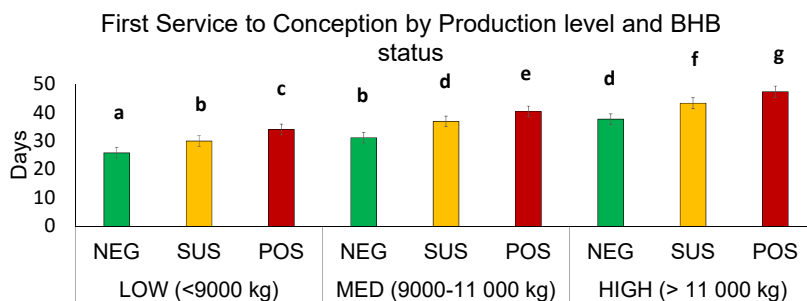
Methods

- 505,412 Holstein cow test-day records (5-35 DIM) from 3,551 herds (Valacta database 2011 – 2017)
 - 159,525 1st lactation, 132,694 2nd lactation and 213,193 3rd + lactation
- Cows were grouped based on 1st test day milk BHB as follows: **NEG**: <0.15 mM **SUSP**: 0.15 to 0.19 mM **POS**: ≥ 0.20 mM

Results



Variable	Parity 1			Parity 2			Parity 3+			SE
	NEG	SUSP	POS	NEG	SUSP	POS	NEG	SUSP	POS	
1 st Service to Conception Interval (d)	20 ^a	23 ^b	25 ^c	34 ^g	41 ^h	44 ⁱ	39 ^r	47 ^s	52 ^t	1.7
Number of Services	1.48 ^a	1.56 ^b	1.61 ^b	1.87 ^g	2.08 ^h	2.20 ⁱ	1.99 ^r	2.22 ^s	2.41 ^t	0.1
Days open (d)	127 ^a	129 ^{ab}	138 ^b	123 ^g	137 ^h	145 ⁱ	130 ^r	143 ^s	154 ^t	4.6



Conclusion

High BHB at first test day was associated with higher 305-d energy-corrected milk yield, reduced pregnancy rates, longer days open, increased 1st service to conception interval, increased number of services, higher culling rates by 60 DIM. Overall, high producing cows were more likely to have elevated BHB levels and were more affected by the impact of high BHB.

- Santschi DE, Lacroix R, Durocher J, Duplessis M, Moore RK, & Lefebvre DM. 2016. Prevalence of elevated milk β -hydroxybutyrate concentrations in Holstein cows measured by Fourier-transform infrared analysis in Dairy Herd Improvement milk samples and association with milk yield and components. *J Dairy Sci.* 99:9263-9270
- Tatone EH, Duffield TF, LeBlanc SJ, DeVries TJ, Gordon JL. 2017. Investigating the within-herd prevalence and risk factors for ketosis in dairy cattle in Ontario as diagnosed by the test-day concentration of β -hydroxybutyrate in milk. *J Dairy Sci.* 100:1308-1318
- Denis-Robichaud, J., J. Dubuc, D.M. Lefebvre, L. Descôteaux. 2014. Accuracy of milk ketone bodies from flow-injection analysis for the diagnosis of hyperketonemia in dairy cows. *J. Dairy Sci.* 97: 3364-3370.