

Are You Ready for the Unintended Consequences of Feeding High Palmitic Acid Fat Supplements?

Choosing the best performing bypass fat supplement has been complicated during the last decade. Research regarding highly enriched palmitic acid supplements (HEPA) showed promise in improving milk fat concentration and yield (Table 1.).

Loss of DMI, no increase in milk yield and reduced body weight gain are the unintended consequences.

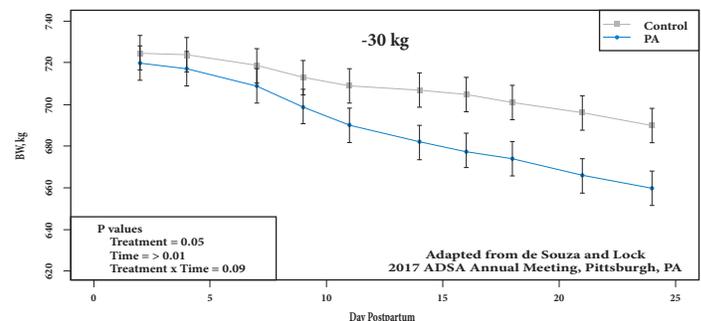
However, a recent meta-analysis (Sellers et al., 2017) revealed that while milk fat concentration and yield were improved there were unintended consequences; a distinct lack of milk yield response, a significant reduction in milk protein %, and a 56% reduction in body weight gain vs. the controls.

Table 1. Effects of highly enriched palmitic acid on milk production and components.

Item	N	Supplemental fat (g/d)	Control Means	Treatment Means	Mean Difference	P - value
Intake						
DMI (lb./d)	11	560 ± 92.5	58.5	57.4	-0.90	0.00927
Milk Yield and Composition						
Milk yield (lb./d)	11	490 ± 89.8	83.1	83.6	0.50	0.45137
Milk fat (%)	11	523 ± 84.7	3.74	3.98	0.24	0.00001
Milk protein (%)	11	517 ± 93.0	3.20	3.15	-0.05	0.00717
Milk lactose (%)	11	549 ± 101.7	4.81	4.76	-0.05	0.00022
Milk Component Yield						
Milk fat yield (lb./d)	11	517 ± 79.5	2.97	3.17	0.08686	0.00001
Milk protein yield (lb./d)	11	525 ± 80.1	2.66	2.64	-0.01497	0.28353
Milk lactose yield (lb./d)	11	534 ± 86.4	4.00	3.96	-0.0267	0.06864
Efficiency						
3.5% FCM/DMI (lb./lb. per d)	8	490 ± 67.8	1.48	1.54	0.05813	0.00888
Body weight change (kg/d)	3	652 ± 189.5	1.65	0.73	-0.42116	0.03973

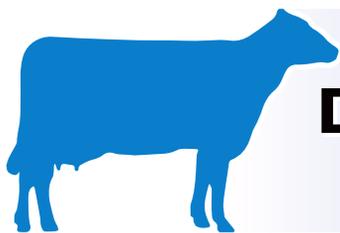
Is the Reduction in Body Weight Gain a True Repeatable Response? Further research by deSouza et al., 2017 revealed that feeding HEPA to fresh cows caused accelerated body weight loss in treated cows vs. control cows (Figure 1.).

Figure 1. The effects of HEPA on body weight loss in fresh cows.



HEPA was fed to cows at 1.5% of the DM from 1-24 days after calving. NEFA was significantly increased 0.59 vs. 0.65 mEq/L, while insulin was significantly reduced, 0.24 vs. 0.21 ug/l for control and HEPA fed cows respectively. They also measured relative gene expression of genes involved in lipolysis, the release of fatty acids from adipose tissue. Those results confirmed that HEPA fed cows experienced elevated levels of lipolysis compared to control cows.

In addition, McFadden reported at the 2017 Cornell Nutrition Conference that HEPA fed cows have increased ceramide concentrations in blood and in the liver. Increased ceramide synthesis increases insulin resistance thus lipolysis occurs increasing plasma NEFA and hepatic triglyceride accumulation. He also reported that palmitic acid is more effective at increasing ceramide synthesis than stearic acid. Figure 2. Illustrates the mechanism of action.

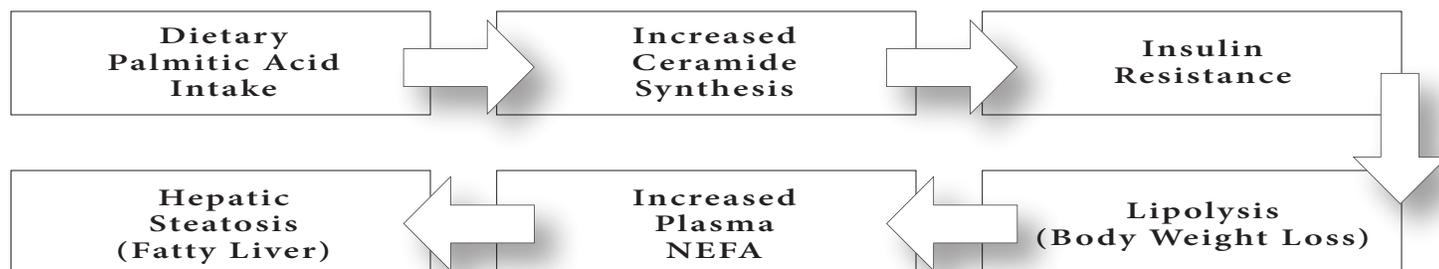


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Figure 2. Mechanism of action of HEPA fed fresh cows and body weight loss



The importance of this relationship cannot be understated. Many consultants and dairymen alike have noticed their cows lose weight when fed HEPA for an extended period of time. It also indicates that the increased milk fat concentration and milk fat yields observed in HEPA trials may not be solely due to the additional HEPA fed to cows. HEPA fed cows mobilize fatty acids from adipose tissue due to the relationship of HEPA and ceramide synthesis resulting in increased circulating NEFA. The mammary gland readily uses circulating NEFA for milk fat synthesis. So, part of the improved milk fat concentration and yield comes from mobilized adipose tissue. This partitioning of energy in fresh cows may have long term negative effects on reproduction and health (Contreras and Sordillo 2011). They concluded that elevated concentrations of NEFA are known to disrupt several immune and inflammatory functions. Cows that are gaining BCS from calving to breeding have been shown to have ~55% greater pregnancy rates at 70 DIM than those that lost BCS from parturition to breeding - ~78% conception rate vs. ~22% (Carvalho et al. 2014).

The unintended consequences of feeding HEPA are many and may have long term effects on health and reproduction.

References

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