

Research Notes

Arm & Hammer Animal Nutrition

Particle Size of ESSENTIOM* Influences Rate of Biohydrogenation and Bypass Fat Reaching the Intestine

Effects of Particle Size of Calcium Salts of Fatty Acids of Biohydrogenation and Disappearance of Essential Fatty Acids *In Sacco*.¹ E. Block, E. Evans, C. Sniffen, N. Clark¹

STUDY OVERVIEW

A study conducted at Atlantic Dairy and Forage Institute, Fredericton Junction, New Brunswick, Canada, compared the effects of particle size of ground and intact ESSENTIOM™* on rates of biohydrogenation and percentage of bypass fat reaching the small intestine.

The study utilized five grams of ESSENTIOM in two different sizes. Samples were either intact or ground to pass through a one millimeter screen. Particle sizes for each are shown in the table at right.

- Two cows averaging 60 pounds of milk were used in the study.
- Each sample was placed in a separate nylon rumen bag and then placed in the rumen of cannulated cows for one-, six-, 12- or 18-hour incubation periods.
- The study was replicated four times per cow, resulting in 32 total samples collected.
- Following incubation, samples were washed in cool water to remove rumen fluid and bacteria, then dried at 39 degrees Celsius.
- Dry matter losses were recorded and individual fatty acids were determined.

Intact ESSENTIOM Particle Size		Ground ESSENTIOM Particle Size	
>2 mm	40.64%	>2mm	0%
2.0 – 0.45 mm	23.45%	1.0 – 0.45 mm	50%
0.45 – 0.1 mm	35.91%	0.45 – 0.1 mm	50%

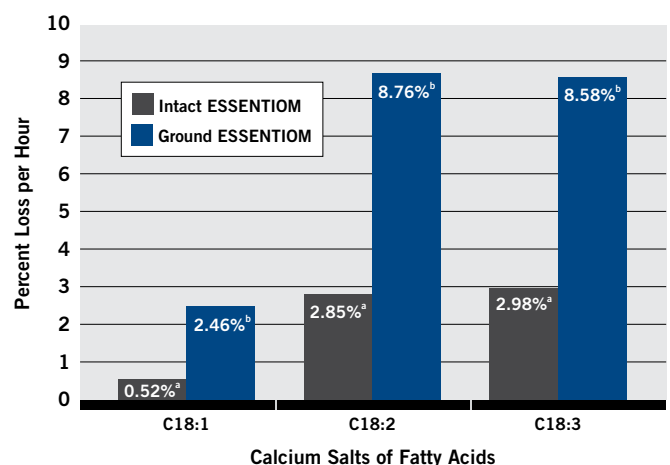
RESULTS

Rate of Biohydrogenation

The intact ESSENTIOM solubilized and left the nylon bags in the rumen significantly slower than the ground ESSENTIOM. This was attributed to the increased time needed by rumen fluid to disassociate the calcium salts into free calcium and fatty acids.

* ESSENTIOM is a renaming of MEGALAC®-R. The product has not changed in form or composition.

RATE OF DISAPPEARANCE OF FATTY ACIDS (BIOHYDROGENATION)



^{a,b} Indicate significant difference $P < 0.01$



Reaching the Small Intestine

More fatty acids reached the small intestine for absorption in the intact ESSENTIOM™ group as ground samples escaped the rumen bags and were likely biohydrogenated by rumen microbes quicker. Research found feeding intact ESSENTIOM resulted in:

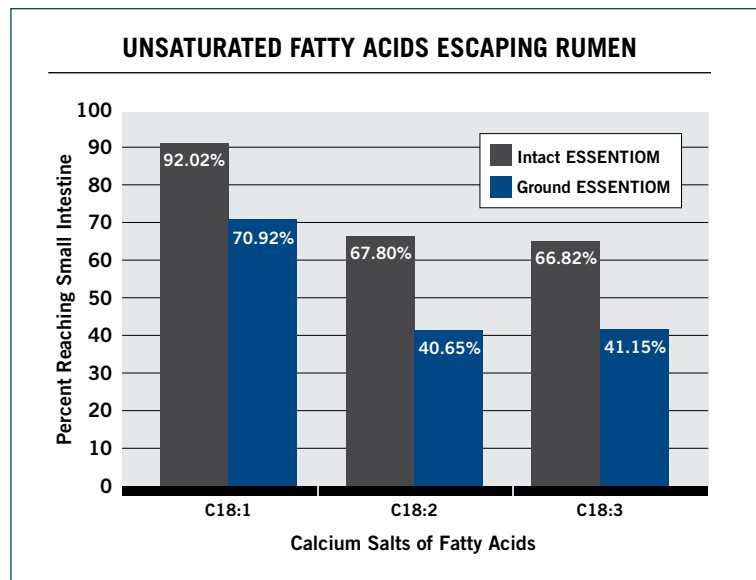
- 53 percent higher passage rates for unsaturated fatty acids.
- Less biohydrogenation, resulting in more ESSENTIOM reaching the small intestine for use by the cow.

CONCLUSION

Particle size of calcium salts in ESSENTIOM is an important factor in reducing the rate of biohydrogenation and improving bypass rates.

- For maximum absorption and utilization it is critical that the highest levels of unsaturated fatty acids, including C18:3 linolenic (Omega-3) and C18:2 linoleic (Omega-6), are delivered to the small intestine.
- Both Omega-3 and Omega-6 are EFAs found in ESSENTIOM, and necessary for optimal reproductive performance.

Particle size and fatty acid composition are not the same across manufacturers, therefore research results focused on calcium salts cannot be used interchangeably.



APPLICATIONS OF RESEARCH FINDINGS

Because of the profound reproductive implications associated with feeding an EFA bypass fat, it is important to feed the most effective and scientifically backed product available. Previous research^{2,3} has concluded cows fed ESSENTIOM experienced:

- **Improved reproductive success**
 - Earlier cycles and larger, high-quality embryos
 - Enhanced visual signs of heat for improved heat detection and conception
 - Improved uterine health and pregnancy maintenance for fewer abortions
- **More pregnancies**
 - More cows pregnant by 126 days in milk
 - Cumulative pregnancies improved by up to 19 percent
 - 21-day pregnancy rate increased by five points
- **Benefits beyond reproduction**
 - Better overall immune function, reducing incidence of metabolic disorders
 - No milk fat depression—maintains production and milk quality
 - Provides economic benefits from healthier cows and greater reproduction

All calcium salts are not created equal, meaning particle size, scientific formulation and effectiveness will vary between different sources. Due to formulation and manufacturing differences, product research for one brand of calcium salts will not represent the efficacy of another brand.

1 Block E, Evans E, Sniffen C, Clark N. Effects of Particle Size of Calcium Salts of Fatty Acids of Biohydrogenation and Disappearance of Essential Fatty Acids *In Sacco*. Presented at the 2008 ADSA Annual Meeting, Indianapolis, Indiana.

2 Jones B, Fish RD, Martin A, Duff GC, Ax RL. Effects of Supplemental Linoleic and Linolenic Acids on Reproduction in Holstein Cows. *Prof Anim Sci* 2008;24:500-505.

3 *EFA Alert Research Summary for Arm & Hammer*, p.24., Princeton, N.J., 2002.

