



## *Starter / Grower Research* Essential Fatty Acids

### **Summary**

The typical calf diet is not formulated with fatty acids in mind, despite the fact that most every diet is deficient in linolenic acid, an essential fatty acid. This report summarizes 5 controlled research trials. In each trial average daily gain was increased when the linolenic acid deficiency was overcome. When a calcium salt of long chain fatty acids high in linolenic acid was supplemented to the diet and at the optimum supplementation rate, the increase in average daily gain over the control was 8%. In 3 of the 5 trials, feed efficiency was improved when linolenic acid was supplemented, while feed intake was not changed in any trial.

### **Research with Linolenic Acid in Calves**

Akey research conducted with weaned calves initially 8 weeks old is summarized in Table 1. In each trial a traditional grower based on 37% corn, 35% supplement pellets, 25% oats, and 3% molasses was fed. The sole source of supplemental protein was soybean meal. In each trial, a calcium salt of long chain fatty acids high in linolenic acid was supplemented. To equalize fat content, a calcium salt of palm oil was included. In trial 1, calves were on trial for 4 weeks and 0, 0.06 or 0.12% linolenic acid was supplemented. The grower diets were blended with 5% chopped grass hay. In trial 2, calves were on trial for 4 weeks and 0, 0.04, 0.08, or 0.12% linolenic acid was supplemented. The grower diets were blended with 5% chopped grass hay. In trial 3, calves were on trial for 8 weeks and 0, 0.06, 0.12, or 0.18% linolenic acid was supplemented. The grower diets were blended with 5% chopped grass hay. In trial 4, calves were on trial for 8 weeks and 0 or 0.12% linolenic acid was supplemented. The grower diets were blended with either 5% or 10% chopped grass hay. In trial 5, calves were on trial for 4 weeks and 0 or 0.12% linolenic acid was supplemented. The grower diets were limit-fed at 5 lb daily with grass hay fed free-choice.

Regardless of the trial length or amount of hay fed, supplemental linolenic acid improved average daily gain and sometimes feed efficiency. This response can easily be seen in the plot of average daily gain relative to supplemental linolenic acid from trials 1, 2, and 3 in Figure 1. The unsupplemented diet contained approximately 0.12% linolenic acid in each trial. The optimum supplementation rate was 0.12% linolenic acid, approximately doubling the amount of linolenic acid in the total diet.

Linoleic and linolenic acids are the two essential fatty acids in the diet of calves and other mammals. The optimum ratio appears to increase with age. For example, in human infants that were born premature, the optimum ratio is between 2:1 and 4:1. In term infants, the optimum ratio is between 6:1 and 8:1. The control diet had a linoleic to linolenic acid ratio of approximately 16:1. The diet with 0.12% supplemental linolenic acid had a linoleic to linolenic acid ratio of approximately 8:1.

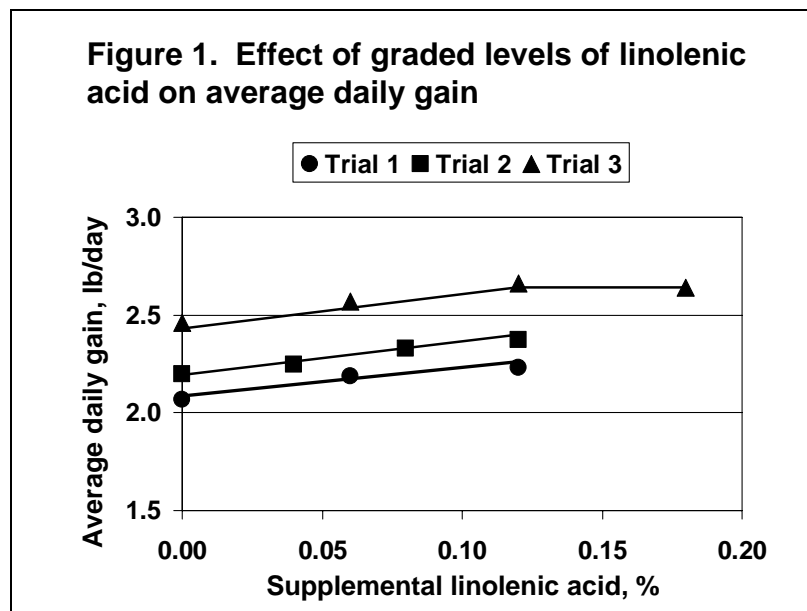
This technology is a part of Akey calf and heifer premixes with A-Boost.

Table 1. Effect of supplemental linolenic acid on average daily gain, intake, and feed efficiency in calves initially 8 weeks of age.

Item <sup>a</sup>	Trial	% linolenic acid supplemented						Significance <sup>b</sup>
		0	0.04	0.06	0.08	0.12	0.18	
<b>ADG, lb/day</b>								
5% hay	1	2.07	--	2.19	--	2.23	--	Linear increase
5% hay	2	2.20	2.25	--	2.33	2.37	--	Linear increase
5% hay	3	2.46	--	2.57	--	2.66	2.64	Linear increase
5% hay	4a	2.32	--	--	--	2.47	--	Increased
10% hay	4b	1.94	--	--	--	2.10	--	Increased
5 lb conc./FC hay	5	1.80	--	--	--	1.97	--	Increased
<b>As-fed intake, lb/day</b>								
5% hay	1	6.64	--	6.65	--	6.60	--	NS
5% hay	2	6.42	6.42	--	6.38	6.38	--	NS
5% hay	3	8.54	--	8.76	--	8.98	8.71	NS
5% hay	4a	7.78	--	--	--	8.40	--	NS
10% hay	4b	7.20	--	--	--	7.34	--	NS
5 lb conc./FC hay	5	6.63	--	--	--	6.50	--	NS
<b>Feed efficiency</b>								
5% hay	1	0.312	--	0.329	--	0.338	--	NS
5% hay	2	0.343	0.350	--	0.365	0.371	--	Linear increase
5% hay	3	0.289	--	0.294	--	0.297	0.303	NS
5% hay	4a	0.298	--	--	--	0.294	--	NS
10% hay	4b	0.270	--	--	--	0.286	--	Increased
5 lb conc./FC hay	5	0.272	--	--	--	0.304	--	Increased

<sup>a</sup> In trial 1, 2, 3, and 4, calves were fed the diets free-choice with the denoted amount of chopped grass hay blended as a total mixed ration. In trial 5, the concentrate was limit-fed at 5 lb per calf daily and grass hay was fed free-choice.

<sup>b</sup> Responses were either a linear increase over level of linolenic acid or an increase from supplementing the single level of linolenic acid ( $P < 0.05$ ). NS denotes no significant response ( $P > 0.05$ ).



References: Prof. Anim. Sci. 23:665-671 (2007); J. Dairy Sci. 92:670-676 (2009)