Intraruminal Vitamin A for Fattening Beef Calves

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Vitamin A supplementation of beef cattle rations has increased tremendously during the past two years, especially in the case of fattening cattle. The increase in this practice has occurred because: (1) Reported instances of vitamin A deficiency have increased in frequency, (2) Several recent experiments have indicated a benefit from vitamin A supplementation of rations presumed adequate in carotene, and (3) Synthetic vitamin A is now relatively cheap. Vitamin A can be administered in several ways. It can be added to the ration, administered orally in large doses or injected into the muscle or rumen in large doses.

It has been shown that such large doses are stored by the animal and gradually utilized. For example, a million I.U. injected into the rumen of a steer will provide sufficient vitamin A for about 70 days. One advantage of a method of administration such as intraruminal injection is that it offers a means of assuring adequate and immediate vitamin A intake for every animal. This may be desirable, for example, when cattle are brought into the feedlot from a situation suspected to be sub-optimum in vitamin A. One experiment station has reported that large intraruminal doses of vitamin A resulted in increased marbling in the carcass. The purpose of this experiment was to determine the influence of intraruminally injected vitamin A on the gain and carcass merit of fattening calves.

Procedure

A group of Angus heifer calves (35 head) and two groups of Angus steer calves (47 and 32 head) were available for this experiment, and were designated Groups A, B, and C respectively. Most of the calves were dropped in February, March and April of 1962 and were being progeny tested for feedlot gain during the winter of 1962-63.

The sires of the calves were known and it was possible to assign equal numbers of calves by each sire to each treatment. This was considered a very desirable feature since marbling is known to be highly heritable and one objective of this experiment was to determine the effect of intraruminal vitamin A on marbling.

Group A heifers and Group B steers were calved in the same herd, and were not creep fed. Each of these two groups was divided into three treatment groups for vitamin A—none, one million I.U., or 2 million I.U. per calf. Group C steers were from a separate herd, and had been creep fed. Since the limited number of calves per sire in this group made it unfeasible to divide each progeny group into three treatment groups, only two vitamin A treatment levels, none and one million I.U., were imposed.

Calves which received vitamin A were given two intraruminal injections at the levels indicated, one 28 and another 120 days after the

Table 1.—Effect of Intraruminal Vitamin A on Daily Gain and Carcass Merit of Fattening Calves, by Groups

Group and Vitamin A Treatment[1]	No. of Calves	140 Days lb.	Last 56 Days lb.	Dressing[2] %	Marbling[3] Score	Carcass[4] Grade	Ribeye[5] Area Sq. In.	Fat[5] Thickness In.
Group A—Heifers								
No Vit. A	12	2.09	1.67	62.5	13.4	10.0	9.06	.79
1 Million I.U.	12	2.09	1.66	61.7	12.9	9.6	9.24	.76
2 Million I. U.	11[6]	2.13	1.78	61.2	14.2	9.8	9.40	.71
Group B—Steers								
No Vit. A	16	2.41	2.12	61.2	14.6	10.0	9.82	.69
1 Million I.U.	15	2.49	2.16	61.3	12.8	9.7	9.83	.73
2 Million I.U.	16	2.60	2.14	61.9	12.8	9.6	9.92	.69
Group C—Steers								
No Vit. A	16	2.43	1.99	62.3	15.2	10.4	9.83	.86
1 Million I.U.	16	2.37	1.92	62.6	15.8	10.5	9.79	.85

[1]Those calves which received vitamin A were given two injections directly into the rumen, each at the level indicated, 140 and 48 days before the conclusion of the fattening period.

[2]Dressing percent was calculated on the basis of shrunk Ft. Reno live weights and chilled carcass weights.

[3]Marbling scores based on a possible range of 1 to 26, from devoid (1-2-3) to very abundant (34-35-36).

[4]9=high good, 10= low choice, 11=average choice.

[5]Ribeye area and fat thickness were determined on tracings.

[6]One heifer died due to a respiratory infection midway through the trial.

beginning of the feeding trial, or 140 and 48 days before the conclusion of the trial. The ration, which was self-fed, was the standard Ft. Reno test ration, composed of 32.5% corn-and-cob meal, 10% whole oats, 10% wheat bran, 10% cottonseed meal, 7.5% molasses, 20% cottonseed hulls, and 10% ground alfalfa hay. A mineral mixture of equal parts salt and bonemeal was available free-choice. The steers were fed in two lots and the heifers in two lots. It was not possible to obtain feed intake and feed efficiency data.

Initial weights were 441, 484, and 571 lb. for Groups A, B and C respectively, and were similar for vitamin A treatment levels within each group. Initial and final weights were taken after a 16-hour shrink without feed and water. Carcass information was obtained following a 72-hour chill.

Results and Discussion

The effect of the intraruminal administration of vitamin A within each group of calves in indicated in Table 1. Vitamin A at the one million I.U. level had little influence on rate of gain. Differences in gain between calves which received no vitamin A and those which received one million I.U. were small and inconsistent. Calves which received two million I.U. of vitamin A gained considerably more than those which received no vitamin A in Group B, but essentially the same in Group A. The only advantage in gain at the one million I.U. level compared to no vitamin A, also occurred in Group B. The reason for this possible difference in response among the groups is not obvious.

The added gain in group B was not accompanied by an increase in carcass grade, marbling score or fatness. Furthermore, it seems that if vitamin A nutrition had been a problem under the conditions of this experiment, there would have been some response to vitamin A at the one million I.U. level in the other two groups.

Differences in dressing percent, marbling, carcass grade, ribeye area, and fat thickness were small and apparently not influenced by vitamin A administration. There would be little reason to anticipate a vitamin A effect upon several of the carcass traits, but marbling and carcass grade were of particular interest, and were not affected by vitamin A in this experiment.

Table 2 presents a summary in which calves in the three groups are combined on the basis of treatment. This summary further emphasizes the general lack of effect from vitamin A administration, but the possible added gain at the two million I.U. level is still apparent.

Table 2.—Summary of the Effect of Intramural Vitamin A on Daily Gain and Carcass Merit of Fattening Calves

Vitamin A Treatment	No. of Calves	Daily Gain		Dressing %	Marbling Score	Carcass Grade	Ribeye Area Sq. In.	Fat Thickness In.
		140 Days lb.	Last 56 Days lb.					
Comparison I[1]								
No Vitamin A	28	2.28	1.93	61.7	14.1	10.0	9.50	.73
1 Million I.U.	27	2.31	1.94	61.4	12.9	9.6	5.57	.74
2 Million I.U.	27	2.41	2.00	61.7	13.3	9.7	9.72	.70
Comparison II[2]								
No. Vitamin A	44	2.33	1.95	62.0	14.5	10.2	9.61	.78
1 Million I.U.	43	2.33	1.93	61.8	14.0	10.0	9.65	.78

[1]Comparison I is a summary of no vitamin A vs. 1 million I.U. vs. 2 million I.U. in groups A and B.

[2]Comparison II is a summary of no vitamin A vs. 1 million I.U. in Groups A, B and C.

Summary

Two intraruminal injections of either one or two million I.U. of vitamin A each during the feeding period were largely without influence on gain and carcass merit of fattening calves. In one comparison calves injected twice with one million I.U. gained slightly more, and those injected twice with two million I.U. gained considerably more than those calves which received no vitamin A. The significance of these differences in view of the lack of response to vitamin A in the other comparisons is not known. Vitamin A had no apparent influence on any of the carcass traits measured, including marbling and carcass grade. Obviously, vitamin A administration might be of considerably more value in other situations and with other rations than was true in this experiment. Apparently the ration fed in this experiment (which contained 10% good quality alfalfa hay) and/or the body storage of the calves provided enough vitamin A to largely meet the needs of the calves.