

Vitamin A Studies With Beef Cattle

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This report is part of an extensive project conducted at the Livestock Unit of the Dickinson Experiment Station, at Dickinson in western North Dakota. The objective of the project to be reported here was: to study the effects of a vitamin A (carotene) deficiency on (a) the breeding performance and (b) the health and thrift of a herd of beef breeding cows. This project was started as a result of reports from various individuals which indicated considerable losses of calves, lambs and pigs at birth or soon after birth and difficult parturition and poor milk production of breeding females.

PROCEDURE AND RESULTS

In the spring of 1946 a group of 36 grade yearling, Hereford heifers were purchased and placed on the livestock unit at Dickinson. These heifers were pastured on native grass range during the summer of 1946. During the winter of 1946-47 they were fed a ration of good grade prairie hay, soybean oil meal and bonemeal.

March 1, 1947 the cows were divided into two uniform lots. The cows in Lot I were given a carotene concentrate to supply 26,400 units of vitamin A per head daily. This supplement was increased to 125,000 units per head daily on June 10. The cows in Lot II served as controls and were given no supplement. The cows were bred before they were turned on pasture and the last of the cows were not pastured until June 26.

The cows were placed in dry lot on November 29, 1947. They were fed a ration of oats, soybean oil meal pellets, minerals and oat-barley straw, a ration very low in carotene. The cows were divided into two lots, with each cow placed in the same lot as during the spring breeding season. Beginning on January 13, 1948 the cows in Lot I were fed a carotene supplement which supplied 27,600 units of vitamin A activity every three days. On February 1 this was increased to 83,000 units daily. On March 20 a carotene-in-oil solution replaced the dry carotene supplement and was fed at the rate of 90,000 units per head daily until the cows were again turned to pasture on May 22, 1948.

As a relationship of vitamin E to vitamin A utilization in laboratory animals had been well established by other investigators, it was decided to study the effect of adding vitamin E to the rations of half of the cows in each lot. The vitamin E was supplied as a dry concentrate containing five per cent alpha tocopherol.

The cows were weighed at monthly intervals and blood samples were taken for carotene and vitamin A analyses. Calving re-

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cords were kept on each cow and calf weights and thrift were recorded. The cows and calves from both lots were pastured as one herd from May 22 until September 13 when all calves were weaned. The results of the 1947-48 feeding season are presented in Table I.

Table I. BODY WEIGHTS AND BLOOD ANALYSES OF CATTLE 1947-48.

Treatment	Vitamins A & E	Vitamin A	Vitamin E	Control
Body wt. of cows, av., lbs.				
Jan. 12, 1948	1062	1059	1024	1027
May 22, 1948	931	927	937	932
Sept. 13, 1948	1049	1029	1056	1029
Blood analyses of cows at end of winter feeding Carotene, micro- grams per 100 ml., blood serum				
	99.4	94.9	54.0	56.8
Vitamin A, I. U.* per 100 ml. blood serum				
	105.1	93.3	92.9	83.8
Body wt. of calves, av., lbs.				
Birth	68.6	64.3	69.2	66.6
Weaning	400.6	336.2	385.0	365.0
Av. daily gain, birth to weaning, lbs.				
	1.79	1.66	1.73	1.65

*I. U. International Unit. One I. U. vitamin A equivalent to 0.6 microgram pure beta carotene.

When the calves were weaned on September 13, 1948 half of the cows from each of the four groups were placed in dry lot and fed all the oat-barley straw they wanted to eat. These cows were put on the straw ration at this time so they would be on a carotene deficient ration for a long winter feeding season. The other half of the cows were turned back to pasture after weaning and were placed in dry lot on November 9, 1948.

The cows were again divided into two lots for the 1948-1949 winter feeding period. The cows that had received the carotene supplement during the previous years were again placed in the supplemented lot.

The ration fed consisted of oats, oat straw, soybean oil meal pellets, salt and minerals. During this year's trial carotene was supplied to the one lot of cows in the form of dehydrated alfalfa meal. The alfalfa meal was pelleted with the soybean oil meal. Sufficient urea was added to these pellets so that the total nitrogen content was the same as the soybean oil meal pellets fed to the control cows. The carotene in these pellets supplied 32,500 units of vitamin A activity per cow daily.

The cows were weighed at regular monthly intervals and blood samples were taken for carotene and vitamin A analyses. The condition and weight of the calves were recorded at birth and at regular intervals. Any difficulties at calving were noted and an estimate was made of the milk supply of each cow. The cows and their calves were turned to pasture on May 25, 1949. The two lots were pastured as one herd during the summer of 1949. The result of this year's winter feeding experiment are presented in Table II.

Table II. BODY WEIGHTS AND BLOOD ANALYSES OF CATTLE 1948-49.

Treatment	Vitamin A	Control
Body wt. of cows, Av. lbs.		
November 9, 1948	1101	1101
May 25, 1949	1018	1003
September 13, 1949	1134	1088
Blood analyses of cows at end of winter feeding Carotene, micrograms per 100 ml. blood serum		
	77	51
Vitamin A, I. U. per 100 ml. blood serum		
	113	86
Body wt. of calves, Av. lbs.		
Birth	74.2	74.0
Weaning	387.3	383.8
Av. da. gain, birth to weaning, lbs.	1.76	1.67

In the spring of 1948 and again in 1949 just prior to the time the cattle were turned on green grass the cows were tested for night blindness. The test conducted in the spring of 1948 indicated that the cows that had received the carotene supplement may have had somewhat more normal night vision. The nature of the test, however, was such that these results were not considered to be conclusive. Very little difference was noted between the two lots in the test conducted in the spring of 1949.

DISCUSSION

During a two year period half of the cow herd maintained on the livestock unit at Dickinson has received a carotene supplement and half no supplement. The carotene supplement was given only during the dry lot feeding season when the cattle were fed a carotene deficient ration of oats, oat-barley straw, soybean oil meal and minerals. The cattle were all pastured during the summer with no supplement fed to either lot.

The monthly blood carotene and vitamin A determinations were analyzed statistically. These analyses showed that the carotene supplement significantly increased the carotene content of the cow's blood but did not produce a significant increase in the blood vitamin A values. The carotene supplement maintained blood vitamin A at a slightly higher level but the difference between the two lots was small.

The carotene supplement fed to the same cows during the two winter feeding periods and an additional breeding season produced no measurable improvement in calf production. There were no consistent differences in the body weights of the cows, birth weight of calves or gains made by the calves during the suckling period. Some calving difficulties were encountered and also a few cases of diarrhea in the calves but there was no apparent difference between the two lots in these factors.

The results of this experiment indicate that if mature cows obtain green feed during the early summer months they are not likely to suffer from a vitamin A deficiency during the remainder of the year. During the 1948-49 feeding period half of the cows were fed the carotene deficient ration for 253 days or over eight months. Although their blood carotene and vitamin A levels declined during this period, their body weights and calf production were not affected. These blood constituents normally drop during the winter as all practical winter rations are much lower in carotene than green spring and summer pasture. The addition of carotene either in oil or as supplied by alfalfa meal brought about no improvement.

SUMMARY

The results of these studies indicate that a vitamin A deficiency is not likely to occur in beef cattle fed under practical western North Dakota conditions. Cows that had been on green pasture during the summer gave satisfactory production when fed a ration deficient in carotene for as long as eight months. The ration fed was adequate in energy, protein and minerals.

During periods of extreme drought a vitamin A deficiency may be more likely. This would be true only when very little green feed was available during the summer and poor quality roughage was fed during the remainder of the year.

BANK-HELD CREDIT IN NORTH DAKOTA

A release dated September 5, 1950 from the news bureau of the American Bankers Association carries the following information on bank-held credit in North Dakota:

Total amount borrowed in 1949.....	\$53,898,000
Outstanding on January 1, 1950.....	26,661,000
Outstanding on January 1, 1949.....	21,203,000

The borrowings and outstanding amounts are the least in any of twelve North Central States, (Ohio, Indiana, Michigan, North Dakota, South Dakota, Minnesota, Wisconsin, Nebraska, Iowa, Illinois, Kansas and Missouri.) The South Dakota figures are roughly double those for North Dakota. (HLW).