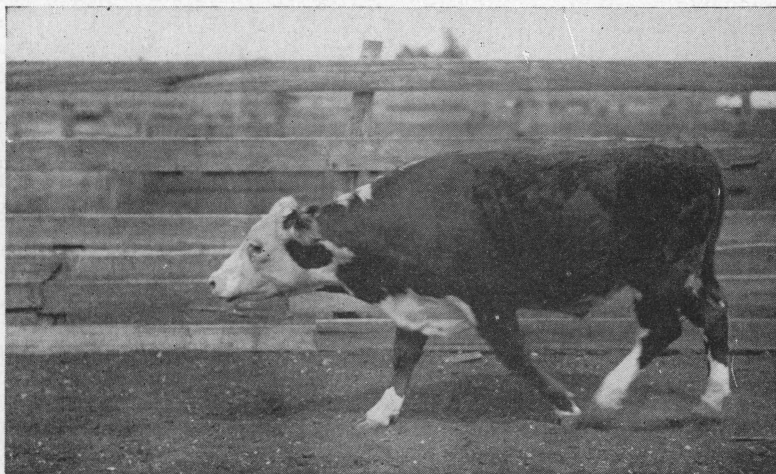


Control of
**VITAMIN A DEFICIENCY
IN FEEDING BEEF CATTLE**



BLIND FROM VITAMIN A DEFICIENCY

*"And the wild asses did stand in the high places, they snuffed up the wind like dragons; their eyes did fail, because there was no grass."
(Jeremiah 14:6)*

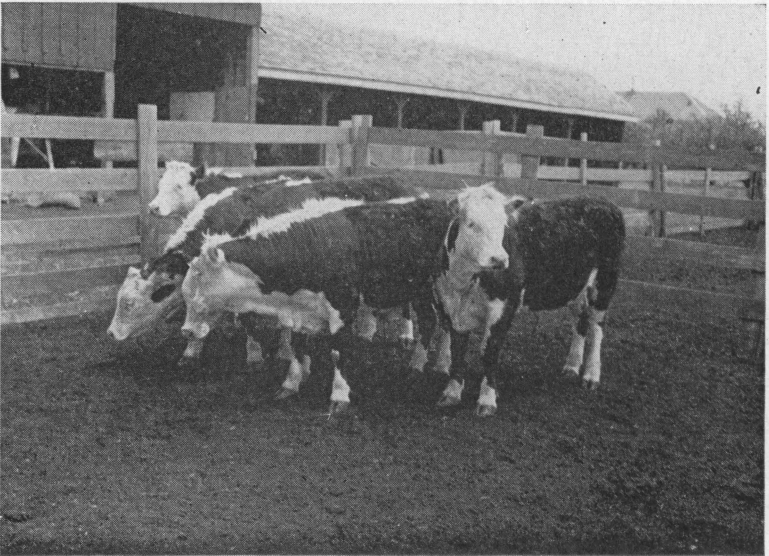
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Control of Vitamin A Deficiency in Feeding Beef Cattle

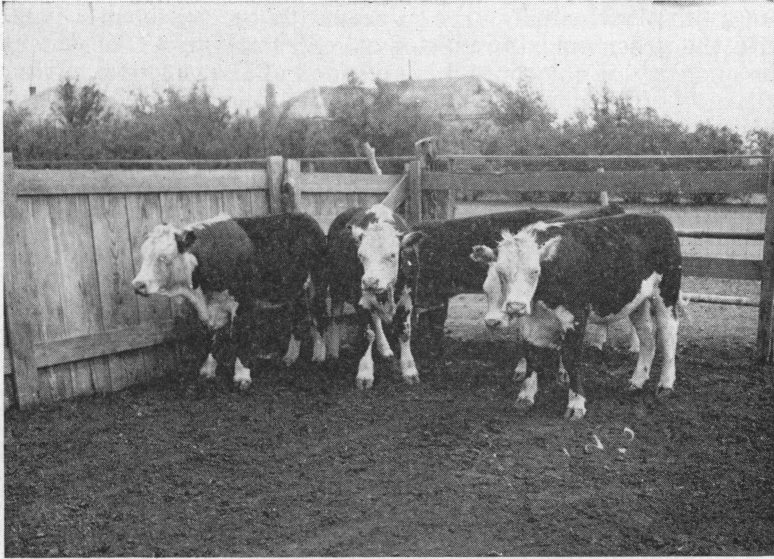
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A condition which has been variously called "cottonseed meal poisoning," "fat sickness," or "mealiness" is known to occur among cattle limited to such rations as cottonseed meal, cottonseed hulls and white corn among the white grains. This condition has been identified as vitamin A deficiency condition and is not caused by any poisonous substance in the cottonseed meal or other feeds.

This condition is characterized in the early stages by night blindness. In later stages the cattle become less alert, "lose their pep" and manifest other symptoms such as watering



1. Steer calves after 140 days in dry lot. These animals were protected from vitamin A deficiency by one pound of good green alfalfa hay in their daily ration.



2. Steer calves after 140 days in dry lot without alfalfa hay in their ration. Note condition of eyes and sluggish appearance as compared to the clean eyes and general alertness of calves in Figure 1.

at the eyes, nasal discharge, swelling at the joints, rapid respiration, staggering gait, convulsions, loss of appetite, and complete blindness.

The calves in 1 and 2 were similar in physical appearance when started on feed. Both groups received a ration composed of cottonseed meal, ground threshed grain sorghum and cottonseed hulls except that the calves in picture 2 did not receive alfalfa hay.

Vitamin A, Its Nature and Occurrence

The vitamin A requirements of farm animals are supplied largely through carotene in range or pasture grasses and hays or other roughage. Ordinarily, grazing animals receive no vitamin A proper which is found in cod-liver or other fish liver oils. However, they are able to change carotene into vitamin A. This process takes place in the liver which is also the chief storehouse of both carotene and vitamin A in the body.

Carotene is formed only in plants, and occurs widely in nature. In pure form, it is an orange red pigment so named

because it was first isolated from carrots. It usually occurs along with active growth and seems to be closely associated with the green coloring matter called chlorophyll. In general the quantity of chlorophyll is an index of the carotene content of plants. Blanched shoots contain little carotene while green shoots contain much. The leaves of fresh green young grasses and legumes, such as alfalfa, contain large amounts of carotene. With the exception of yellow corn, other cereal grains and the oil bearing seeds are low in vitamin A potency and are ordinarily not adequate to meet the requirements of animals.

Both carotene and vitamin A are destroyed in the presence of air and light. The process is hastened at high temperatures, but heat in the absence of oxygen has only a minor effect. Large losses in carotene occur during the curing of roughages, especially when they are dried in direct sunlight. Loss of green color in hays or fodders means that a large percentage of the vitamin A potency is lost. It has been reported that vitamin A potency is almost completely lost when the leaves of plants dry up and die. In the artificial drying or curing of fresh green forages much less carotene is lost than in curing under natural conditions. In some cases large losses of carotene may occur when forages are stored in the silo. Cattle fed for long periods on silage may suffer from vitamin A deficiency just as if they had been fed weathered dry forage or cottonseed hulls.

The above facts give a new conception of quality in roughage and emphasize the need of care in harvesting to preserve the color in forages intended for cattle feeds.

Symptoms of Vitamin A Deficiency

The need of animals for green feeds, and the symptoms accompanying vitamin A deficiency have long been known. In the Bible, (Jeremiah 14:6) the statement: "And the wild asses did stand in the high places, they snuffed up the wind like dragons; their eyes did fail, because there was no grass," indicates knowledge of the effect of drouth, or lack of green feed upon the well-being of animals. Hippocrates (460-357 BC) is quoted as advocating an abundance of liver as a remedy for night blindness, which shows the the involvement of the eye in deficient diets has been recognized from ancient times.

With feedlot cattle, simple night blindness, in most cases, is the first definite outward symptom. When driven about the

lot after dark those which are night blind will bump into objects, and those only partially night blind will be observed to walk about cautiously.

Other symptoms previously mentioned may vary in order of occurrence, but watering at the eyes with some swelling usually may be noted soon after night blindness or partial night blindness occurs. (It is to be noted, however, that watering at the eyes may be caused by conditions other than vitamin A deficiency.)

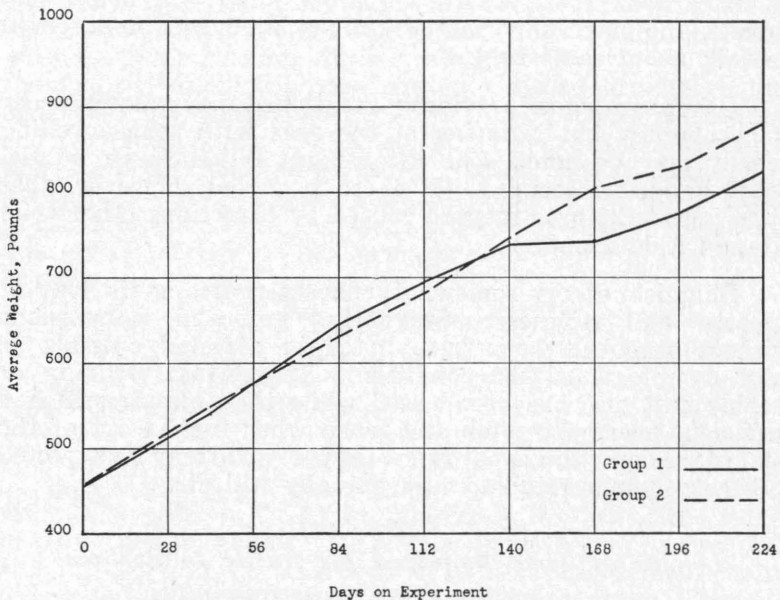
Sluggishness is somewhat characteristic, as is loss of appetite and stiffness. Staggering gait and convulsions without exception have been noted in affected animals as later symptoms of the condition. Staggering, weaving or wobbly gait also has been noted while the animals still had sufficient energy to pitch and frolic when turned out of the lot. If the condition is not remedied the cattle may be expected to become unmarketable and eventually will die.

Length of Time Required for Cattle to Become Affected with Vitamin A Deficiency

Following drouth periods when a limited amount of green pasturage has been available, the time required for cattle to become affected after placement in dry lot on deficient rations is less than after periods of abundant green pasturage. Having been subjected to the same pasture conditions younger animals become affected in less time than older ones. There are marked differences also between single animals which have received the same treatment and which are of the same age classification.

In general, steer calves of 250 to 400 pounds may be expected to show affected condition after 40 to 80 days, those of 400 pounds or above after 80 to 140 days, and steer yearlings after 100 to 150 days. Calves born to cows which have been confined to such rations as cottonseed meal and cottonseed hulls for 60 to 90 days usually die from the deficiency within 2 or 3 weeks unless placed on cows receiving adequate vitamin A potency in their rations.

Feeder calves or yearlings may go for considerable periods in the feedlot without suffering from vitamin A deficiency, but it is evident that these periods are not long enough for fattening young animals to a high degree of finish, which may require 200 days or more.



3. Weight curves of steers fed a ration of cottonseed meal, white grain and cottonseed hulls. Group 1 - Not protected from vitamin A deficiency for the first 140 days. Group 2 - Protected from vitamin A deficiency by the addition of 1 pound of alfalfa hay per head daily to their ration.

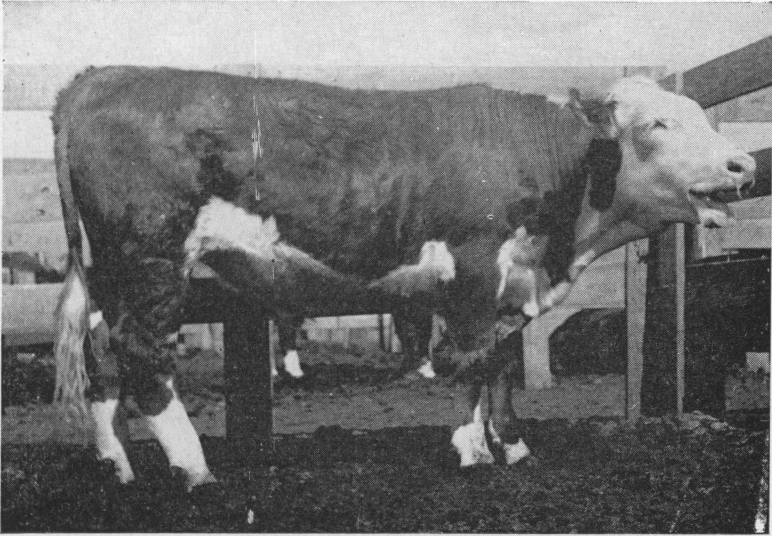
Influence of Vitamin A on Gains and Finish

Lack of vitamin A potency in the ration apparently has little or no effect upon the rate of gain as long as the cattle have reserves of the vitamin in the body. Figure 3 shows the gains made by the steers shown in photographs 1 and 2 during a 224-day feeding period.

Both groups made almost exactly the same gains for the first 140 days but at that point Group 1, having shown symptoms of deficiency, suffered loss of appetite and ceased to gain in weight. Group 2, receiving 1 pound of alfalfa per head daily, continued to make comparatively uniform gain for a 224-day period and showed only slight irregularity in gain when their ration was continued unchanged for 203 days longer.

Treatments for Vitamin A Deficiency

All of the 10 steers in Group 1, (Figure 3), became more or less seriously affected by the deficiency, and one which did not receive restorative treatment died after 181 days. Of



4. Steer suffering from heat.

the remainder, three were given 10cc, 25cc and 50cc of codliver oil per head daily and showed marked improvement in appetite and condition after about 15 days. Alfalfa hay, or green alfalfa, and green sudan were also effective treatments. While the various treatments caused improvement, the steers did not completely regain the ground lost while they were sick, as may be noted by comparison with Group 2, Figure 3. These results make it obvious that fed cattle should not be allowed to reach an advanced state of depletion of vitamin A reserves before they are given alfalfa hay or other feeds high in vitamin A potency.

Suggestions

Small amounts of leafy alfalfa hay of good green color will protect growing and fattening cattle from vitamin A deficiency. Other material high in vitamin A potency, such as codliver oil, and green grasses and legumes, also will prevent and at least partially remedy the condition if it has been allowed to occur. Practically all legume hays such as peanut hay and clover hay, if of good color, may be expected to have about the same value in controlling vitamin A deficiency as alfalfa hay. Although the carotene in sorghum silage does not appear to be as available as that in alfalfa hay

the silage may be expected to supply sufficient carotene to prevent symptoms of vitamin A deficiency in usual fattening periods for steers. Silage exposed to the wind and sunshine lose their carotene value rapidly. Dehydrated green forage such as sudan grass, barley, wheat, oats, rye, are excellent sources of carotene. These forage crops should be harvested in early stages of growth.

Summary

In feeding rations low in vitamin A potency such as cottonseed meal and cottonseed hulls only, or white grains, cottonseed meal and low grade weathered roughages, vitamin A supplements are apparently not needed for the first 50 to 80 days except in the case of young calves which should receive a supplement from the beginning of the feeding period. To guard against any occurrence of the deficiency condition watch for the onset of night blindness. In testing for night blindness, simply go into the feed pen after dark and move the cattle about. Even partial blindness may be detected by an observant stockman. As soon as the first signs of night blindness are observed, begin to feed 1 to 2 pounds of good quality leafy green alfalfa hay per head daily in addition to the regular ration. Do not allow the cattle to reach the stage of "going off feed" before starting them on alfalfa or other protective feed, because some might reach a condition of vitamin A deficiency as is shown in 4. Silage fed in the usual amounts in rations for fattening steers may be expected to prevent symptoms of vitamin A deficiency. Dehydrated forage harvested in early stages of growth will insure vitamin A needs of rations.

FOOTNOTE: This discussion is based on work conducted at Substation No. 7, Spur, Texas, Texas Agricultural Experiment Station and Bureau of Animal Industry cooperating, and reported in Texas Agricultural Experiment Station Bulletin No. 630.