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NebGuide

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Vitamin Requirements of Beef Cattle

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Vitamins are organic substances that are required in very small quantities for various metabolic functions. Twenty-five to 30 have been identified, but cattle can synthesize all that are needed of these vitamins in the rumen except for 2 or 3. Even though the supplemental amounts needed of these 2 or 3 vitamins (A and possibly D and E) are quite small, a deficiency can have a drastic effect on the animal.

Vitamin A. Vitamn A is required for maintaining the skin; lining of the mouth, eye, gut, genital tract; in bone formation and functioning of the eye in the dark. The vitamin A requirement can be met from carotene (provitamin A) in feedstuffs or by oral or injected vitamin A supplements. One milligram of carotene is equal to 400 international units (I.U.) of vitamin A for cattle. Suggested minimum requirements per pound of ration dry matter are: growing and finishing cattle 1,000 I.U. (2,200/kg); pregnant heifers and cows, 1,300 I.U. (2,800/kg); lactating beef cows and bulls, 1,800 I.U. (3,900/kg).

A rough guide for vitamin A supplementation in I.U. per head daily is: wintering calves, 10,000; finishing cattle, 30,000; dry pregnant cows during last 1/3 of pregnancy, 20,000; cows nursing calves during early lactation, 50,000.

Doubling or tripling the vitamin A level during periods of stress, such as in newly arrived feeder cattle, may be advisable for rapid build-up of vitamin A. The injection of one million I.U. of vitamin A palmitate intramuscularly will provide sufficient vitamin A for 2 to 4 months in growing and breeding beef cattle.

Where protein supplements are not fed, stabilized vitamin A can be mixed and fed in the salt-mineral mixtures. The amount of vitamin A needed will vary with the salt or mineral intake. A rough guide for mixing is to add 1 million I.U. of vitamin A per pound of salt (2.2 m/kg) before calving and 2 1/2 million I.U. per pound of salt (5.5 m/kg) after calving. This will allow for considerable destruction of vitamin A before consumption and yet provide adequate vitamin A intake. A 2-4 week supply of the vitamin A-salt mixture can be mixed at one time, but only enough for about one week placed before the cattle at one time.

Cattle store vitamin A in the liver and body fat during times of abundant intake. These reserves can reduce the requirement for supplemental vitamin A or meet the needs of nonlactating older cattle for 4-6 months.

Carotene is destroyed in feeds during storage. In hays and other forages, the vitamin A value decreases after the bloom stage and much of the carotene is destroyed by oxidation during field curing. Thus, deficiencies are likely to occur in early winter in cattle previously grazed on weathered forages or in late winter in cattle previously grazed on green pastures in the summer and then fed the current year's stored hay.

A mild deficiency results in reduced feed intake and poor gains, but no outward symptoms. More severe deficiencies result in night blindness, muscular incoordination, staggering gait and convulsive seizures. Other symptoms are diarrhea, lameness in the hock and knee joints and swelling of the brisket area. An animal deficient in vitamin A may become more susceptible to pinkeye. Many of the eye problems attributed to a vitamin A deficiency may actually be due to pinkeye. In bulls, sexual activity and semen quality is reduced. In cows, conception rate is impaired and when deficient at or shortly after conception, fetal abnormalities may occur. In pregnant cows

deficient at or near term, abortion or birth of dead, weak or blind calves and retained placentas can occur.

Vitamin D. Beef cattle usually have adequate vitamin D by synthesis in their bodies through exposure to direct sunlight or from eating sun cured hay. Cattle fed under roof may not manufacture adequate vitamin D. Their ration should include 120 I.U. of synthetic vitamin D per pound of dry matter or about 1/10 the level of vitamin A.

Vitamin D deficiency in calves produces rickets. The symptoms of a vitamin D deficiency are those of a calcium and phosphorus deficiency, as the principle action of vitamin D is to increase the absorption of calcium and phosphorus from the intestine. Vitamin D also has a direct effect on the calcification process in bone. Clinical symptoms, usually preceded by a decrease in blood calcium and inorganic phosphorus, are poor appetite, decreased growth rate, digestive disturbances, stiffness, labored breathing, irritability, weakness and, occasionally, tetany and convulsions. Later, enlargement of the joints and bowing of the legs occur. Symptoms develop more slowly in older cattle. A vitamin D deficiency can result in the birth of deformed or dead calves.

Vitamin E. Natural feedstuffs appear to supply adequate quantities of vitamin E for adult cattle under most Nebraska conditions. Young calves deficient in vitamin E will show symptoms of white muscle disease, usually between the ages of 2 and 12 weeks. The most common symptoms are heart failure and paralysis, and a hollow or swayed back. Vitamin E serves as a physiological antioxidant, and its biochemical roles in the body appear to be related to its antioxidant capability. Adequate selenium in the ration spares the need for vitamin E. Thus, areas like Nebraska, where selenium content of feeds is relatively high, have a low incidence of vitamin E deficiency and relatively little need for vitamin E supplementation.

If a problem exists, the most effective way to prevent vitamin E deficiency in calves is to supplement the ration of the cow during the last 60 days of gestation and during the first part of lactation with 2-4 I.U. of vitamin E per pound (4.4-8.8 I.U./kg) of ration or 50-100 I.U. per head daily. Oral administration is more effective than injection, but injections can be used if oral administration as a supplement is not being fed.

Vitamin K. Vitamin K is synthesized in the rumen of cattle in adequate amounts under most feeding conditions. Vitamin K is involved in the blood clotting mechanism. The symptom of a deficiency is excessive bleeding. Cattle fed moldy sweet clover hay may show symptoms of a vitamin K deficiency because it contains dicoumarol, which interferes with the normal activity of vitamin K in blood clotting. This problem is often called sweet clover poisoning or bleeding disease. Mild cases of this disease can be effectively treated by administering vitamin K_3 and not feeding moldy sweet clover hay.

B Vitamins. B vitamins are synthesized by microorganisms in adequate quantities in the normally functioning rumen and, usually, a source of B vitamins is not needed in the ration of ruminants. Unusual feeding conditions, such as a severe protein deficiency and prolonged illness, could impair rumen fermentation to such an extent that sufficient quantities of B vitamins would not be synthesized. Milk usually supplies B vitamins (thiamine, biotin, niacin, pyridoxine, pantothenic acid, riboflavin and vitamin B_{12}) needed by calves during the first 8 weeks of their life prior to the development of a functioning rumen. Calves with scours may need supplemental B vitamins.

In most cases, the various B vitamins function as constituents of cellular enzyme systems and are necessary for the metabolism of nutrients.

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