



WHEN SHOULD WE BE CONCERNED ABOUT VITAMIN A SUPPLEMENTATION?

Lawton Stewart, Ph.D.

Department of Animal and Dairy Science

Vitamins are a unique dietary component for beef cattle and are categorized into two groups: water-soluble and fat-soluble. Bacteria in the rumen synthesize water-soluble vitamins (e.g. B12, thiamin, niacin). Therefore, supplementation is generally not needed as long as the rumen is functioning properly. This leaves the fat-soluble vitamins (A, D, E, and K). Of these, Vitamin A is considered the most important when feeding cattle.

What is Vitamin A and why is it important?

Vitamin A, also known as retinol, is a compound that is essential for growth, reproduction, maintenance of body tissue, and bone development. Technically, Vitamin A is not found in plant material; rather, the precursors carotenes and carotenoids, are present in various forms. Carotene is a general term for a group of pigments found in plants (As you may have deduced, this comes from the Latin word for carrot). When ingested, these are converted to Vitamin A and utilized by the animal.

Where is Vitamin A found, and can the body store it?

Since actual vitamin A is not found in feedstuffs, the equivalent amount of precursors is expressed as international units (IU). All forms and precursors will be referred to as Vitamin A for simplicity. Except for corn and corn byproducts, most grains and commodity feeds will not provide an appreciable amount of Vitamin A. The major source for cattle is fresh forage. However, Vitamin A is rapidly degraded by heat and sunlight, therefore hay is much lower in Vitamin A compared to fresh forage. Additionally, as forage matures and/or becomes drought-stressed, the Vitamin A content will decrease. Ensiled forage (silage and baleage) does lose some Vitamin A, but not to the extent of hay. A recent study evaluated the Vitamin A content of several common feedstuffs used for cattle and are presented in [Table 1](#).



Table 1. Vitamin A content of common feedstuffs

Feedstuff	Vitamin A, IU/lb of feed (dry matter)
Fresh pasture	18,000
Corn silage	3,000
Fescue hay	1,300
Dried <u>distillers</u> grains	200
Whole shell corn	100
Soybean hulls	20

Adapted from Pickworth, 2012.

The daily requirement for beef cattle is presented in [Table 2](#). The requirement increases as cattle mature and is greatest for lactating cows. Fortunately, the liver can store Vitamin A, and this storage can serve to prevent a deficiency. Typically, this storage can last two to four months. However, the storage can be variable and cannot be accurately assessed without a liver biopsy.

Table 2. Daily Vitamin A requirement for cattle as international units (IU) per pound of feed and IU per day.

Stage of Production	-----Vitamin A-----	
	IU/lb of feed	IU per animal/day¹
Growing cattle	1,000	13,000
Gestating cow	1,300	33,000
Lactating Cow	1,800	52,000

¹Calculated based on a 500 lb weaned steer/heifer and a 1,200 lb mature cow.

What are the signs of deficiency and how are they caused?

A major function of vitamin A is associated with vision, specifically with the transition from light to dark. Therefore, night blindness is a key symptom to identify a vitamin A deficiency when other symptoms are also present.

Symptoms of deficiency

- Night blindness
- Decreased reproductive performance
- Skin and hoof lesions
- Skeletal deformation



Deficiency symptoms are most likely to occur from one or more of these feeds

1. Feeds that have received excess exposure to sunlight, air, and high temperatures.
2. Hay harvested from drought conditions.
3. Feeds that have been stored for long periods of time.
4. Feeds that have been heavily processed.
5. High-concentrate diets (e.g. finishing rations).

Basically, cattle that are maintained on a hay diet through most of the winter could be susceptible to a Vitamin A deficiency. However, if we look specifically at this year, there is a higher-than-normal possibility for deficiency. Most parts of the state faced some level of drought this summer, then much of South Georgia was impacted by Hurricane Helene this fall. This created a “triple whammy” because: 1. A lot of hay that was harvested this year was under drought conditions, 2. Cattle consumed less fresh forage than usual and supplementation was likely used, and 3. Cattle are consuming hay earlier and for longer periods, potentially relying on hay leftover from previous years. It is imperative to evaluate what level of supplementation is needed now before performance is impacted.

How much Vitamin A do cattle need and what are supplementation options?

The daily requirement (IU per pound of feed and total intake) of cattle is presented in [Table 2](#). Based on the amount of Vitamin A in fresh and ensiled forage, the requirements of all cattle are met. However, when feeding hay, the requirement is not met. Moreover, it can be assumed that drought-harvested hay or last year’s hay will not contribute any Vitamin A.

[Table 3](#) presents several winter-feeding scenarios for lactating cows this year. First, the Vitamin A requirement is met if winter-annual grazing, even when limit-grazed, is utilized. Second, if older and/or low-quality hay is used, then cattle will likely become deficient in Vitamin A during the winter. Even when mixing in higher-quality hay, a lactating cow’s requirement will not be met. Most of these scenarios will result in cattle not receiving their Vitamin A requirement. Many cattle will likely deplete any liver storage of Vitamin A by mid to late winter and performance will be affected if supplementation is not provided.



Table 3. Amount of Vitamin A provided in different winter-feeding situations, potential deficiency, and supplement needed for a lactating cow.

Feed source	Provided, IU/day	Deficiency, IU/day	Amount needed in a 4 oz mineral, IU/lb
Winter-annual grazing	522,000	-	-
Limited-grazed winter annual and old or drought-stressed hay ¹	261,000	-	-
Old or drought-stressed hay and no supplement	0	52,000	231,000
Old or drought-stressed hay and 4 lb supplement ²	440	51,560	228,000
50% high-quality hay ³ , 50% old or drought-stressed hay and no supplement	21,750	30,250	132,000
50% high quality hay, 50% old or drought-stressed hay and 4 lb supplement	19,200	32,800	145,000

¹ Old or drought stressed hay is assumed to provide no Vitamin A.

² Estimated intake of 50% winter-annual and 50% hay.

³ High-quality hay estimated to contain 1,500 IU Vitamin A/lb of dry forage.

⁴ Supplement is a 50:50 mix of corn gluten feed and soybean hulls.

The simple solution is to provide a mineral that provides adequate Vitamin A. Most minerals do contain a vitamin pack, but the question becomes, “is it enough?”. Many times, it is assumed that just as long as it is included, it should be adequate. The last column of **Table 3** gives the amount of Vitamin A needed in a mineral mix (i.e. what is listed on the tag) to meet the requirement with an additional 10% as insurance. This amount changes significantly based on the feeding program, and each producers will have a unique situation.

Hopefully, these values can help gauge the amount of supplementation needed. If a mineral contains more than what is needed, that is perfectly fine. If you need help evaluating your vitamin and mineral nutrition, please contact your local UGA Extension Office (extension.uga.edu or 1-800-ASK-UGA-1)