

# ETHANOL FEEDS

FEEDING DISTILLERS GRAINS TO BEEF CATTLE

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Iowa State University Extension

## How Much Distillers' Grains Can I feed?

By Dan Loy

As corn prices rise a common question among cattle feeders is, How much can I feed?. The desire to feed higher levels has been tempered by concurrent increases in the prices of corn coproducts. However as of early 2007, wet CGF, modified DG and wet DG are priced at 75–85% of the price of corn, adjusted for moisture. DDG and dry CGF were approximately 100 and 90% of the corn price respectively. Any time the net cost of distillers grains in the feedbunk, adjusted for moisture, is less than the cost of corn, then the incentive is to feed levels beyond meeting the protein requirement.

The exact level depends on the first limiting factor which will vary from product to product. Beyond the economic factors just mentioned, the factors which might limit the inclusion of distillers grains in a feedlot ration include the level of fat in the total diet and the total sulfur intake of the animals. Moisture levels could reduce feed consumption at high levels of very high moisture coproducts, and the high fiber content or lack of starch has been theorized as a limitation for feedlot diets. Moisture and fiber appear to be secondary to the fat and sulfur issues. For feedlots with limited land resources, the concentration of P and N in the manure could become an issue.

Sulfur is likely the first factor to limit the amount of corn coproducts that can be fed in many situations. Sulfur levels of most corn coproducts can range from .4 to .9% S on a dry matter basis. Some liquid coproducts have been tested as high as 1.5 to 2% S. Sulfur is added during both the wet and dry corn milling process, so the coproducts contain additional levels above that concentrated from the original corn. Although it is based on limited research in cattle, the NRC recommends a maximum tolerable level of .4% of the ration dry matter for sulfur in the ration. Using that recommendation as a guide the maximum level of corn coproducts would range from 30% of the dry matter at high sulfur levels (.9%) to over 70% at low levels, based strictly on the sulfur content.

### UPCOMING MEETINGS ON DISTILLERS GRAINS

Eddyville	February 5 <sup>th</sup>
Bonaparte	February 13 <sup>th</sup>
Charles City	February 15 <sup>th</sup>
Chariton	February 19 <sup>th</sup>
Ottumwa (CCCC)	February 24 <sup>th</sup>
Spencer	February 28 <sup>th</sup>
Chariton	March 5 <sup>th</sup>
Jefferson	March 13 <sup>th</sup>
Ames	March 15 <sup>th</sup>
Emmetsburg	March 22 <sup>nd</sup>

As far as fat is concerned, previous research with high oil feeds such as whole soybeans or cottonseed meal suggest that feed intake in feedlot cattle starts to back off when greater than 5% of the ration dry matter in the form of fat is added. Since distillers grains are 9–12% oil, fat would restrict their use to around 50% of the ration. This would give a total fat content of the ration of around 8%. In rations where fat is added, typically no more than 3–4% is added in the form of tallow or yellow grease.

Several experiments have been conducted where excellent performance was achieved at levels in the 40–50% range. Studies where higher levels have been fed are fewer, but less successful. It appears that the practical limit for feeding distillers grains to beef cattle is approximately 50% of the dry matter. Changes in milling technology that reduce oil and/or sulfur content could dramatically increase this level.



For suggestions, comments, questions or to get on the mailing list please contact us at [beefcenter@iastate.edu](mailto:beefcenter@iastate.edu) or give us a call at 515-294-BEEF.

## “Polio” and Sulfur Toxicity

By Steve Ensley and Terry Engelken

Polioencephalomalacia (“Polio”) was first reported in 1956 and was described as a disorder of the nervous system of cattle. This condition is characterized by blindness, incoordination, staggering, and seizures. Polio is actually not named for these clinical signs, but for the changes that occur in the brain. To detect the lesions of polio, examination of the brain at a diagnostic lab is required. In some cases of polio you can observe the cell death occurring in the brain. The necrosis occurs at the junction of the gray and white matter, usually in the front half of the brain. If you have a black light, this area of necrosis can fluoresce with an apple green appearance.

Polio in cattle was thought at one time to be caused exclusively by a thiamine deficiency. Under normal conditions, cattle produce adequate levels of B vitamins in their rumen. The deficiency was thought to develop because the rumen did not produce enough thiamine or products such as amprolium inhibited thiamine production. Some of the confusion surrounding the cause of polio is because there is no economically available method to accurately evaluate thiamine status in animals, either in the bloodstream or in the rumen.

There are several other causes of polio that have been identified. It is now known that the brain lesions observed in cattle with polio can be caused by sulfur toxicity, lead toxicity, salt toxicity, decreased oxygen availability to the brain, thiamine deficiency, and damage to the brain’s blood supply. Sulfur toxicity is still responsive to thiamine treatment but is not caused by a thiamine deficiency. At one time, “blind staggers” observed in Wyoming was thought to be caused by selenium toxicity. This theory has now been discounted and the condition is known to be caused by sulfur toxicity.

When sulfur is ingested in excess, rumen microbes produce too much hydrogen sulfide. The hydrosulfide stays in the rumen fluid and hydrogen sulfide gas accumulates in the rumen gas cap. The hydrogen sulfide is absorbed across the rumen wall into the blood stream. A small portion of hydrogen sulfide can be eructated from the rumen and absorbed through the lung. This elevated level of sulfide in the blood interferes with cellular energy production. Since the brain has a high requirement for energy production it can be severely affected.

Sulfur intake can occur in the feed or water so the total dietary intake of sulfur is needed in order to evaluate the risk of developing polio. This is especially pertinent in Iowa now because of ethanol byproducts, especially dried distillers grain with solubles (DDGS).

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Ethanol byproducts may contain a high concentration of sulfur. When cattle are transitioning to high sulfate intake conditions, the ruminal sulfide concentration peaks 1 to 3 weeks after the change.

The National Research Council recommends that the maximum tolerable dietary concentration of sulfur in the ration on a dry matter basis not exceed 0.4%. Not all cattle consuming 0.4% or more will develop clinical polio. Researchers in South Dakota indicate that dietary sulfur levels of 0.7% of dry matter or greater may cause polio in growing cattle. Other factors such as ruminal microbial populations, trace element concentration or ruminal pH can affect sulfur production and absorption. Insoluble metal sulfides of copper, iron or zinc could decrease the availability of sulfide. As the pH decreases, the amount of hydrogen sulfide in the gas cap increases. This pH decrease is commonly seen as feedlot cattle come up on feed and this change in diet may increase the chance of polio occurring. Sulfur associated polio occurs in two forms. There is an acute and subacute form. In the acute form sudden death is observed, in the subacute form there are a range of signs from ataxia to blindness to down and recumbant.

Animals that die while showing these clinical signs should be necropsied by your veterinarian. The best diagnostic specimen at this time is brain that has been placed in formalin. We are currently investigating analysis of fresh brain and possible additional tissues for sulfide content. In polio cases, it is also important to analyze water and feed for sulfur levels. There is much variability in the sulfur content from ethanol byproducts, both within an ethanol plant and between plants, so periodic sampling may have to be done to have an accurate idea of the dietary intake of sulfur.

Treatment for polio cases is not very specific, but it does involve proper supportive care for the animal. Injectable thiamine, steroids, or other anti-inflammatory drugs can have beneficial effects and may be recommended by your veterinarian. When animals go off feed with polio, production of sulfide ceases and this is one of the reasons subacutely affected animals recover without treatment. Removal of animals from sulfur sources is the most important control measure.