

Sulfur Toxicity Due to Feeding High Levels of Corn Gluten Meal

In today's economy as more and more corn is used in the manufacture of ethanol, corn syrup, and other corn products we are finding that while corn prices are on the rise, corn byproduct feeds are available in ever greater supplies and at attractive prices. The livestock producer's need for economical feedstuffs is made even greater by the current weather pattern that has made forages more scarce and expensive than usual, and in many cases of poor quality. These byproduct feeds can be a valuable feed resource, but they require more management and care in their feeding. One of the more common problems associated with byproduct feeds is sulfur toxicity from corn gluten meal, a byproduct of the corn syrup industry.

During the industrial process, the corn is treated with sulfuric acid. Since this chemical is valuable it is reclaimed as much as possible from the byproduct corn gluten. Batches vary widely, however, on how much sulfur is left in the feed. Unless batches are checked for sulfur content, it is hard to tell how much you can safely use in the ration. Sulfur also comes from other feeds in the ration and often from the water source. The following chart shows typical sulfur contents for various feedstuffs. Typically, if the sulfur content of the overall intake of the animal is between .3 and .4%, you can expect to see problems such as reduced feed intake and poor performance. When the averaged level is above .4% you can expect to see clinical disease. Therefore, if using feeds with high sulfur content such as corn gluten meal, you must combine it with feeds containing low amounts of sulfur such as corn, sorghum, or silage.

Sulfur Concentrations of Feedstuffs

Feed	Sulfur (% of DM)	Feed	Sulfur (% of DM)
Alfalfa hay	0.30	Corn steep liquor	0.70
Barley malt sprouts	0.85	Corn gluten meal	0.90
Beet pulp, dehydrated	0.22	Molasses, beet	0.60
Beet pulp w/ molasses	0.42	Molasses, cane	0.47
Blood meal	0.80	Sorghum grain	0.14
Brewers grains	0.40	Sorghum silage	0.10
Canola meal	1.17	Soybean hull pellets	0.11
Corn, dent	0.14	Soybean meal	0.46
Corn silage	0.12	Sunflower meal	0.33
Corn distiller grains	0.44	Turnip root	0.43
Corn gluten feed	0.47	Wheat midds	0.22
		Whey, dehydrated	1.12

Sulfur toxicity is usually not a problem in monogastric animals because most of the inorganic sulfur found in feeds is relatively inert. In ruminants however, problems occur because the microflora of the rumen convert the inert sulfates to sulfides which cause the problems. Initially the organisms' ability to convert sulfur is limited, but after 10 to 12 days on high sulfur feeds, the capacity to form sulfides is greatly increased. The sulfides are absorbed directly into the blood stream across the rumen wall, and also get to the lungs and brain tissue when the sulfides are belched with the rumen gases and then inhaled. The resulting condition is called polioencephalomalacia (PEM), which is necrosis of certain parts of the brain tissue.

The clinical signs of PEM include head pressing into inanimate objects, fixed stare (star gazing), blindness, staggering, convulsions, recumbancy and death within 48 hours. Animals may also exhibit respiratory distress due to damage to lung tissue and sulfides tying up some of the oxygen carrying capacity of the blood. Thiamine is a sulfur containing B vitamin produced by the organisms in the rumen. The relationship between thiamine, the enzymes that control it's levels, and PEM are not fully understood, but a complex relationship exists. Many times the administration of injectable thiamine is beneficial in the treatment of sulfur induced PEM, but sometimes nothing is effective. The degree of help derived from thiamine depends on the severity and longevity of the disease process. Some animals recover but always have CNS problems while some animals will return to apparently normal healthy status if taken off of the problem feed source soon enough.

Prevention of sulfur toxicity consists mainly of knowing the amount of sulfur in the byproduct feeds used and mixing it with a suitable amount of low sulfur feedstuffs to bring the total sulfur levels down to safe values. Corn gluten meal can be a valuable addition to your feeding program when properly combined with low sulfur feeds as a portion of a well thought out complete ration. It will pay dividends however, to be careful to keep it to safe levels.