Do DDGS affect feedlot cattle health?

Project Title:

Effect of Alternative Feeding Dried Distillers Grains on Animal Health in Feedlot Cattle

Project Code:	ANH.03.09
Completed:	*March 2013*

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Background:

Corn, wheat and other grains contain 68-70% starch, 10-13% protein, 2-4% oil, 2-3% fiber and 2% minerals. Bioethanol production only uses the starch from the grain. Therefore, the protein, oil, fiber, and minerals are much more concentrated in the dried distillers' grains with solubles (DDGS) by-product than in the original grain.

DDGS may be incorporated into feedlot diets depending on cost and availability. Feeding DDGS may have positive or negative impacts on animal health. For instance, the lower starch and higher fiber levels of distillers' grains (compared to traditional feed grains) may reduce the risk of acidosis and benefit rumen, liver and hoof health. However, DDGS products are very finely ground, which means that the fiber may not be as effective in stimulating proper rumen function. This might increase the risk of acidosis, rumen, liver and hoof health problems.

The increased sulfur concentration in DDGS may increase the risk of polioencephalomalacia (PEM), a nervous disorder that has been observed in both high grain diets and high sulfur diets. Thiamine is a B-vitamin that is important for normal nerve function. Grains contain high levels of thiamine, but low rumen pH or sudden drops in rumen pH can encourage naturally occurring thiaminase enzymes in the rumen to break thiamine down, so thiamine supplementation may be recommended. High sulfur intakes (e.g. high sulfur water or high rates of DDGS inclusion rates) may also require thiamine supplementation.

Objective:

To evaluate animal health and performance impacts of yearling cattle finished on rations containing variable levels of wheat-based DDGS.

What they did:

Three trials were conducted.

Large pen study: 6,815 commercial feeder steers were fed finishing rations containing 93% concentrate, 5% barley silage and 2% supplement. The control diet concentrate contained only dry-rolled barley. The three treatment diets replaced 22.5% of the dry-rolled barley with wheat DDGS, corn DDGS, or DDGS from a wheat-corn blend. Individual animal growth, lameness and health treatments were recorded, and animals that died or were euthanized were autopsied. Liver, brain, rumen, hoof, and other samples from each autopsy were examined for diet-related pathological lesions. At slaughter, all animals were evaluated for carcass characteristics as well as rumen and liver lesions.

Small pen study: 288 crossbred beef steers were backgrounded at the University of Saskatchewan for 70 days, then stepped up to finishing diets. The backgrounding diets contained 34% concentrate, 59% forage and 7% supplement; finishing diets contained 87% concentrate, 7% forage and 6% supplement. The control diet concentrate contained only rolled barley, and the three treatments replaced 40% of the barley with wheat, corn or blend DDGS. Cattle were blood sampled for sulfur before, during and at the end of the feeding period.

Metabolic study: Groups of four heifers were fed diets that contained low sulfur (0.3%) and low silage (4%), high sulfur (0.67%) and high silage (51%), low sulfur and high silage, or high sulfur and low silage. Sulfur levels were modified by using different sources of DDGS as well as by adding elemental sulfur. Heifers were adjusted to the forage:concentrate diets over 31 days. Sulfur levels were adjusted at the start of the 37 day study. Rumen (pH, volatile fatty acids, thiamine, sulfur and trace minerals), blood (thiamine and sulfur) and urine (sulfur and trace minerals) samples were collected over a 37 day period. The heifers were euthanized at the end of the study, and each brain was examined for signs of PEM.

What they learned:

Large pen study: Overall mortality rates were the same among the diets, and there were no differences in the rates of grain overload, rumenitis, or foot lesions. Although liver disease caused three deaths in the wheat DDGS diet and none in the other diets, liver abscesses were equally common among diets at the packing plant. No differences in mortality were seen due to nervous disorders or brain disease.

Small pen study: The DDGS containing diets contained between 50% and 258% more sulfur than the control diet. Sulfur levels ranged from 0.2 to 0.3% of the diet in the backgrounding phase and from 0.2 to 0.65% in the finishing phase. Serum sulfur levels did not differ among treatments at the start of the experiment, but cattle fed the DDGS diets had 22 to 49% higher serum sulfur levels than the control cattle when the feeding trial ended. No clinical signs of PEM were observed, perhaps because thiamine was supplanted (15mg thiamine/kg dry matter fed) during the finishing phase.

Metabolic study: The effects of high sulfur levels were the same regardless of the level of grain in the diet. The high sulfur diet led to a higher rumen pH (likely due to reduced intake), and increased sulfur levels in the rumen, blood and urine. The high sulfur diet reduced total thiamine levels in the rumen, no change in the serum, and increased total thiamine levels in the brain.

What it means:

Dietary sulfur levels can vary among different sources of DDGS, and this can affect sulfur levels in the rumen, blood and urine. Feeding DDGS at up to 40% of the diet did not increase the risk of PEM or metabolic disease in these studies.

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Proudly Funded By:

The Beef Cattle Industry Science Cluster is funded by the Beef Cattle Research Council, a division of the Canadian Cattlemen's Association, and Agriculture and Agri-Food Canada to advance research and technology transfer supporting the Canadian beef industry's vision to be recognized as a preferred supplier of healthy, high quality beef, cattle and genetics.

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