

Post Mortem Copper Concentrations in the Liver of Feedlot Steers Fed Condensed Corn Distillers Solubles

A.S. Leaflet R2507

Steve Ensley, veterinary toxicologist;
Gary Osweiler, veterinary toxicologist;
Garland Dahlke, extension program specialist;
M. Peter Hoffman, professor of animal science,
Iowa Beef Center;
Wayne Roush, superintendent of Western Iowa Research
Farm, Castana, IA

Summary and Implications

Condensed corn distillers solubles fed over an extended period may have some impact on liver tissue copper concentration due to the high sulfur content of this feedstuff. However, if the total ration concentration of sulfur is maintained below 0.30 percent of the diet as dry matter intake there does not seem to be any adverse effect in steers in terms of causing brain lesions.

Introduction

The use of condensed corn distillers solubles (CCDS) as a feedstuff for cattle has become widespread in Iowa and in other areas supporting an ethanol industry. The use of this feedstuff may lead to health problems due to sulfur toxicity caused by the elevated sulfur content of this feed if it is fed at a high percent of the total ration on a dry matter basis. This trial investigated the effect of this feedstuff when fed at moderate levels on liver copper concentrations and brain tissue.

Material and Methods

A comparison of liver copper concentrations along with brain tissue between cattle fed known feedlot rations which contained CCDS or were void of CCDS was done. Liver tissue samples from steers were collected at harvest from Tyson Fresh Meats in Denison Iowa. Liver tissue concentrations of copper were then analyzed by atomic absorption at the chemistry laboratory in the Veterinary Diagnostic Laboratory at Iowa State University. Likewise, a sample of brain tissue from each treatment was recovered from this plant as well at this time in order to evaluate the brain. The brains were examined microscopically.

The copper analysis and histopathology were performed at the Iowa State University Veterinary Diagnostic Laboratory. The cattle sampled were on one of five different feeding programs. A group of cattle designated as "F" was on a feedlot ration after weaning which did not have any CCDS in the mix. A group of cattle designated as "FCCDS" likewise were placed on a feedlot ration after weaning but were also supplied with CCDS as a part of this ration. A third group designated "PF" was placed on a feedlot ration containing CCDS, but were housed on a grass pasture which provided ad libitum forage. A fourth group, labeled "P" was placed on pasture and not fed in the feedlot until cattle in the group were about one year in age. This group did not receive any CCDS. A fifth group, labeled "PCCDS" was also backgrounded on pasture until a year of age, but supplemented with CCDS on the pasture. This group was then moved to a feedyard and finished using the feedlot ration which contained CCDS. The two feedlot rations are provided in Table 1. Sulfur levels along with copper and iron would be considered higher than recommended by the National Research Council, but not excessive or toxic to cattle.

Iowa State University Animal Industry Report 2010

Table 1. Rations.

Feedstuff	Control Feedlot Ration	CCDS Feedlot Ration
Corn (whole)	73.57%	53.16 %
Molasses	3.00%	
Alfalfa hay	18.00%	18.00%
Control Supplement	5.34%	
CCDS Supplement		3.84%
CCDS		25%
Dry Matter	85.38%	71.12%
Cr. Protein	13.00%	13.00%
NPN	1.96%	0.93%
Ne G	58.1 Mcal/cwt	58.7 Mcal/cwt
Fat	3.78%	5.36%
Calcium	0.90%	0.76%
Phosphorus	0.30%	0.37%
Sulfur	0.19%	0.27%
Copper	27.43 ppm	27.98 ppm
Iron	128.37 ppm	121.84 ppm

*Concentrations given on a 100% dry matter basis

Results

Table 2 indicates the diet effect on liver copper concentrations. There was some notable effect of the CCDS on the cattle. This effect seems to become more pronounced over time since cattle placed on pasture without CCDS (P) store a significantly higher level of copper into liver tissue than those fed CCDS while on pasture (PCCDS). This effect is less apparent when doing a feedlot comparison between group F and group FCCDS. It is thought that the impact is lessened due to a decreased exposure to the CCDS since the pasture cattle were maintained for a longer time

and the PCCDS group received CCDS both during backgrounding and finishing. The PF group was much more variable, but tended to maintain liver copper concentrations near the groups with no CCDS. What the actual sulfur concentration in this group's ration was could not be determined due to the forage intake variability.

A summary of brain tissue evaluated for lesions is provided in Table 3. There did seem to be a treatment effect, however it would not be due to the CCDS since the highest incidence of brain lesions occurred in the cattle which did not receive any CCDS.

Table 2 Liver Copper Levels.

Treatment	Mean Liver Cu (ppm)	Std. Error	Significance
F	78.48	4.07	AB
FCCDS	73.25	4.07	A
P	93.34	4.18	B
PCCDS	69.45	4.07	A
PF	78.57	6.89	AB

*Difference Letters indicates significance at 0.05 level

Table 3. Brain Lesions.

Treatment	Brain Lesions	Significance
F	14.3%	A
FCCDS	7.1%	A
P	43.8%	B
PCCDS	15.4%	A

*Difference Letters indicates significance at 0.05 level