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FACTORS AFFECTING GOSSYPOL TOXICITY

R. D. Randel, D. B. Herd and K. S. Lusby

Background. The source of gossypol and type of diet also affect the levels of gossypol tolerated by cattle. It is the amount of free gossypol presented to the abomasum (escaping detoxification in the rumen) rather than the amount of dietary gossypol that is the most important indicator of potential toxicity.

Current Information. Reasons for differences in toxicity of gossypol from different sources are still speculative at this point. Gossypol appears to be more of a problem in high concentrate, low roughage diets where rate of passage from the rumen is rapid and there is less time for exposure of gossypol to detoxification in the rumen. Cattle may be able to tolerate higher levels of gossypol on high roughage or forage diets where slower passage takes place. Cottonseed hull-based diets may be an exception, however, because of their rapid rate of passage.

Higher levels of free gossypol are apparently tolerated in whole cottonseed than in cottonseed meal. Possibly the gossypol in whole cottonseed is released more slowly and the cottonseed spends more time in the rumen than does cottonseed meal.

Gossypol acetate, a purified form of gossypol, has been used in some studies on gossypol toxicity. This form of gossypol is extremely toxic - it passes through the rumen very quickly and undergoes little detoxification. Toxic levels of gossypol from feeding gossypol acetate cannot be extrapolated to cottonseed meal and whole cottonseed.

In a recent Texas A&M survey, free gossypol levels in whole cottonseed ranged from .47 to .63% (4700 to 6300 PPM) and in cottonseed meal from .079 to .298% (790 to 2980 PPM) on an as-fed basis. "Old process" meals will average about .04% (400 PPM), expander-solvent processed meals about .1% (1000 PPM) and direct solvent meals about .3% (3000 PPM). Cottonseed hulls usually contain much lower levels of free gossypol.

There is apparently a large margin of safety for feeding whole cottonseed to cattle. Texas research (Coppock et al., 1985, J. Dairy Sci. 68:2248) showed no effects of gossypol toxicity when whole cottonseed (.38% free gossypol) made up 30% of dry dairy cows diets. In fact, recent Texas research with beef cows has suggested that feeding whole cottonseed as 20 to 30% of the total diet for 30 to 60 days prior to breeding may improve rebreeding. No detrimental effects were observed (Williams et al., 1989. Inf. Rep. 89-1, Texas Ag. Exp. Stat.). There are limits to the ability of ruminants to detoxify gossypol, but they appear to be able to detoxify adequate amounts of the free gossypol contained in "normal" supplementation levels of cottonseed

meal or whole cottonseed.

Recommendation. Ruminant animals can tolerate much greater quantities of free gossypol than can monogastric animals. Preruminant calves (under 8 weeks of age to be safe) should not be fed gossypol-containing products.