

Protein for Feeder Cattle Diets

Level of Protein with Today's Implants

Using estradiol/trenbolone acetate (E/TBA) combination implants increases the animal's requirement for crude protein (CP) compared to estradiol implants. However, TBA makes the animal more efficient, so CP requirements are not as high as some people suggest. Initial research demonstrated that E/TBA implants improved gain and efficiency of CP use at 11% CP (Table 1). Gain improved and efficiency of CP use declined at 14% CP, indicating that the CP requirement was higher than 11% CP but not as high as 14% CP. Extrapolating the CP requirement as CP efficiency times daily gain divided by dry matter intake ($.550 \times 4.26 / 19.6$), equals 11.95% CP required. Both the 1996 Beef NRC model or the Akey Brill Beef Program estimate a CP requirement of approximately 12% for these cattle. The results of a similar trial (Table 2) suggest that the CP requirement of E/TBA implanted cattle was met with an 11.25% CP diet. These data and other data suggest that CP requirements are higher with E/TBA implant, but not up to 13% or 14% CP as some people choose to formulate. Certainly, the intake of the cattle is a factor in the percent requirement, since the absolute requirement is an amount. Specific sets of cattle could have low intakes and have a need for a higher percent CP diet than is typically estimated, but the quantity of CP required is still the same.

Degradable Crude Protein

The requirements for protein are delineated into degradable crude protein (DP), that is required by the rumen microbes, and metabolizable protein (MP) which is required by the animal. DP is a combination of protein that solubilizes in rumen fluid and insoluble protein that is degraded by the microbes. MP is a combination of microbial protein synthesized in the rumen and the undegraded feed protein (by-pass protein). Failure to meet the DP requirement will result in a reduction of microbial protein synthesis and MP supply. If the DP requirement is exceeded, no additional microbial protein will be synthesized and the excess nitrogen will be wasted.

Table 1. E/TBA* Implants vs. Diet CP
(708 lb Calves)

Implant	--	E/TBA	E/TBA
% CP/Source	11	11	14
CP Source	Urea	Urea	U/SBM
0 to 85 days			
DM Intake, lb	18.0	18.5	19.6
ADG, lb	3.30	3.70	4.26
Feed Gain	5.54	5.02	4.67
CP Intake, lb	1.98	2.04	2.74
CP Efficiency	.600	.550	.644

*Estradiol/trenbolone acetate combination

Source: IA State University

Table 2. E/TBA Implants vs. Diet CP
(800 lb Yearlings)

% CP	11.25	13.5	11.25	13.5
CP Source	Urea	Urea	SBM	U/SBM
DM Intake, lb	22.7	21.6	22.8	21.8
ADG, lb	4.27	4.16	4.51	4.25
Feed Gain	5.35	5.20	5.06	5.13
CP Intake, lb	2.55	2.92	2.56	2.94
CP Efficiency	.597	.702	.568	.692

*Estradiol/trenbolone acetate combination

Source: SD State University (U=Urea, S=SBM)

Table 3. By-Pass vs. Degradable Protein
(740 lb Yearlings, E/TBA*)

½ of CP:	Urea			SBM 44		
	--	BP**	SBM	--	BP**	SBM
Diet CP, %	10.8	12.8	12.8	10.8	12.8	12.8
DM Intake, lb	25.5	24.51	24.9	23.9	24.4	23.6
ADG, lb	3.72	3.70	3.88	3.79	3.71	3.79
Feed Gain	6.86	6.64	6.41	6.32	6.56	6.25

*Estradiol/trenbolone acetate combination implants
**BP=by-pass protein (blood and corn gluten meal)

Source: KS State University

Feeding excessive amounts of by-pass protein sources (at the expense of DP) depresses microbial protein synthesis and thus reduces MP supply and gains (Table 3). Protein sources like soybean meal (SBM), corn gluten feed (CGF), and corn steep liquor (CSL) are excellent protein sources because they contribute to DP and can contribute to MP when fed in excess of the DP requirement. Urea, on the other hand, will not. Experiments with dry processed corn show that when all the supplemental protein comes from urea, maximum gain is not achieved because urea exceeds the DP requirement (Tables 2 and 4). An experiment with high moisture processed corn reflects that much more urea can be used, and is required, compared to experiments with dry corn (Table 5). More urea may be needed to synchronize DP with degraded carbohydrates.

Table 4. Soybean Meal vs. Urea
(785 lb Yearlings, E/TBA*)

	SBM 44 : Urea			
	100:0	67:33	33:67	0:100
DM Intake, lb	20.8	20.7	20.1	19.7
ADG, lb	3.05	3.26	3.29	3.11
Feed Gain	6.82	6.33	6.11	6.33

*Estradiol/trenbolone acetate combination implants

Source: KS State University

Table 5. Level of Urea With High Moisture Corn
(825 lb Yearlings, E/TBA*)

% Urea, DM Basis	0	.4	.8	1.2
ADG, lb/day	27.1	26.8	26.5	26.6
DMI, lb/day	3.76	3.78	4.00	4.07
Feed/Gain	7.19	7.09	6.62	6.53

*Estradiol/trenbolone acetate combination implants

Source: Univ. NE, 1996

The Value of Corn By-products

Corn by-products like bran, CSL, CGF, distiller's grains (DG), and corn distiller's solubles (CDS) can be added to reduce daily feed costs and improve daily gains (Table 6 and 7). CSL, CGF, and CDS are good sources of DP and DG is a good source of by-pass protein. It is recommended that some urea be fed with DG to meet DP requirements; however, because of other factors, DG without urea can support greater gains than SBM. Corn by-products appear to reduce rumen acidosis and support greater intakes compared to other forms of supplemental protein. DG and CDS have a significant fat content that contributes to part of the improved performance when they are fed.

Table 6. Value of Corn-Byproducts
(16 Trial Summary)

	SBM/U*	CGF*	Distillers
DM Intake, lb	21.8	22.7	22.4
ADG, lb	3.50	3.78	3.99
Feed Gain	6.22	6.01	5.61

*SBM/U = soybean meal and urea, CGF = corn gluten meal

Sources: University NE, IA State University

Diets with Added Fat

Adding fat to high grain diets (over .60 NEg, less than 10% effective NDF) reduces dry matter intake (Table 7). There is less of a depressive effect on intake if the fat is added with corn by-products or via corn by-products. If intake is substantially reduced, the percent dietary protein must be increased to maintain the amount of CP fed.

Table 7. Value of CGF* and Fat
(750 lb Yearlings)

CP Source:	SBM/U*	SBM/U*	CGF*	CGF*
Added Fat:	No	Yes	No	Yes
ADG, lb	3.44	3.60	3.76	3.97
DM Intake, lb	24.6	24.2	23.9	24.0
Feed Gain	7.06	6.63	6.29	6.01

*SBM/U = soybean meal and urea, CGF = corn gluten feed

Source: University NE