

**Protein Synthesis in the Rumen from Single or Mixed Sources of Nitrogen (Project 596).**

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Opinion differs on the value of single or mixed sources of added protein in beef rations. This experiment was to determine the percentage total nitrogen and protein nitrogen present in rumen ingesta of steers fed a single source of nitrogen and combinations of two, three and four sources (% nitrogen  $\times 6.25 =$  % protein). Four rumen-fistulated steers were used. Prairie hay served as the roughage; alfalfa hay, cottonseed oil meal, soybean oil meal and urea as sources of nitrogen. All feed ingredients were analyzed and equal amounts of added nitrogen were used in all cases. When mixed sources were used, each ingredient contributed an equal amount of nitrogen. Thus the rations fed were isonitrogenous. Where urea was fed, corn was added to make the rations isocaloric. The first test was conducted without grain (except 1 pound daily with urea). The second test was conducted with added grain. One steer died from "hardware disease" at the end of the first test. That left only three steers, so alfalfa hay was omitted in the second test.

**Results**

Results of the first test are shown in Table 37. There were significant differences in percent total nitrogen and protein nitrogen; however, the lowest amount was greater than is recommended. Thus, it is obvious that all sources of nitrogen were utilized by the microorganisms in amounts to make sufficient protein available for digestion. Significantly higher total nitrogen and protein nitrogen were available from soybean meal and cottonseed meal than from urea except when both soybean and cottonseed meal were fed. No combinations of sources produced significantly more total nitrogen and protein nitrogen in the rumen than soybean oil meal or cottonseed meal fed alone, except the soybean and cottonseed meal combination.

Results of the second test with grain added to the ration are shown in Table 38. Total nitrogen and protein nitrogen were not significantly different in the rumen of steers fed soybean oil meal or cottonseed meal or a combination of soybean oil meal and cottonseed meal. Steers fed soybean oil meal or cottonseed meal had significantly higher total nitrogen and protein nitrogen than any whose ration contained urea.

Those results show differences in the ability of sources of nitrogen to provide total and protein nitrogen in the rumen. The oilseed meals were best. Soybean oil meal or cottonseed meal fed individually was equal to or superior to combinations of sources of nitrogen in all but one case. Thus, so far as protein per se is concerned, mixed sources of nitrogen (protein) show no advantage in beef cattle rations.

**Table 37**  
Average percentage total nitrogen and protein nitrogen of the rumen samples from the fistulated steers fed rations having different sources of additional nitrogen in varying combinations without added grain.

	Source of nitrogen							
	S	C	A	U	S+U	S+A	S+U+A	U+A
Average total nitrogen, % <sup>†</sup>	2.05	1.98	1.86	1.73	2.29	2.15	1.86	2.20
Average protein nitrogen, % <sup>‡</sup>	1.30	1.36	1.52	1.62	2.07	1.92	1.76	1.96
Average protein nitrogen as percentage of total nitrogen, %	92.68	93.93	92.47	93.64	90.04	89.31	94.62	89.69
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	C+U	A+U	S+U+A	S+A+U	S+U+A+U	C+A+U	S+C+A+U	S+C+A+U
Average total nitrogen, % <sup>†</sup>	1.88	1.88	2.03	1.74	1.93	1.81	1.94	1.94
Average protein nitrogen, % <sup>‡</sup>	1.76	1.76	1.82	1.53	1.72	1.55	1.76	1.76
Average protein nitrogen as percentage of total nitrogen, %	93.62	93.62	89.65	87.93	89.12	85.63	90.72	90.72

A = Alfalfa hay, S = Soybean oil meal, U = Urea, C = Cottonseed oil meal.

<sup>†</sup> % nitrogen  $\times 6.25 =$  % protein.

**Table 38**  
Average percentage total nitrogen and protein nitrogen of the rumen samples from the fistulated steers fed rations having different sources of additional nitrogen in varying combinations with added grain.

	Source of nitrogen					
	Soybean oil meal	Cottonseed oil meal	Urea	Soybean oil meal + cottonseed oil meal	Soybean oil meal + urea	Cottonseed oil meal + urea
Average total nitrogen, % <sup>†</sup>	2.53	2.67	2.33	2.46	2.28	2.27
Average protein nitrogen, % <sup>‡</sup>	2.25	2.39	2.91	2.99	1.95	1.93
Average protein nitrogen as a percentage of total nitrogen, %	85.55	89.51	86.22	84.95	85.52	85.95

<sup>†</sup> % nitrogen  $\times 6.25 =$  % protein.