

## Influence of Urease Inhibitors on Urea Hydrolysis in Ruminants (Project 596).

D. C. Loper, D. Richardson and L. H. Harbers

The data from the 1965 Livestock Feeders' Day Bulletin indicate that ammonia production from animals fed urea rations was higher than that from nonurea rations. For the bacteria to "capture" more ammonia from urea rations and utilize it, several experiments were designed to test the effect of a variety of chemicals that theoretically would inhibit urea hydrolysis per se. These were initially screened by an artificial rumen technique. The chemicals exhibiting inhibition were then tested inside fistulated steers to simulate practical feeding conditions. At the same time several products were fed to sheep for digestibility data. A preliminary report of the data follows.

### Results and Discussion

Sixteen compounds were tested in the artificial rumen at various concentrations from 0.1 to 500 p.p.m. The test lasted 1 hour; criterion of response was ammonia production (table 11). It is evident that the inorganic ions (copper, cobalt) and some antibiotics retard urea hydrolysis. The copper and cobalt compounds are the most potent and least expensive inhibitors. Unfortunately their action is not specific so they will also act on and poison enzymes needed to break down various starches and fibers.

Results from the digestion study with sheep, however, suggest that copper sulfate may improve nitrogen retention (table 12). Data from individual sheep suggest that if the animal had low nitrogen retention, the percentage retained would be improved by copper sulfate. Lambs tested received 16 gm. of urea daily, which is near the recommended level. It thus appears that if animals are fed those levels of urea, the inhibitors tested do not alter the parameters measured. Experiments are now being conducted to determine the effect of increased urea levels on ammonia production in the rumen in the presence of various inhibitors.

Table 11  
Effect of urease inhibitors on In Vitro urea hydrolysis.

<u>Chemical</u>	<u>Result</u> <sup>1</sup>	<u>Chemical</u>	<u>Result</u> <sup>1</sup>
Bacitracin - MD	I	Sulfamethazine	NE
Copper Sulfate	I	Alpha - keto - glutarate	S
Neomycin Sulfate	I	Uracil	S
Zinc Bacitracin	NE	Cobalt Chloride	I
Sephadex	NE	Kayexalote	NE
CM - Sephadex - C25	NE	Copper Chloride	I
Methylene Disalysalate	NE	Procaine Penicillin	S
Neomycin Polycarboxylate	NE	Chlortetracycline - HCl	S

1. I = inhibitory; NE = no effect; S = stimulatory.

Table 12  
Apparent digestion coefficients of sheep fed rations containing urease inhibitors.

<u>Treatment</u>	<u>% N Retained</u>	<u>Apparent Digestion Coefficients</u>					
		<u>Protein</u>	<u>Dry Matter</u>	<u>Ash</u>	<u>Ether Extract</u>	<u>Crude Fiber</u>	<u>NFE</u>
Control	14.61	53.64	63.49	36.34	81.87	33.70	75.21
Copper Sulfate	15.73	52.37	62.67	35.07	81.31	31.42	74.57
Neomycin Sulfate	14.73	50.05	59.90	45.61	86.49	27.88	71.37
Bacitracin - MD	14.38	50.38	60.36	37.63	82.99	27.55	72.69