**Effect of replacing urea direct supplementation with urea-protected additives on ruminal fermentation and rumen ammonia concentration in beef cattle**

**Application:** The use of slow urea liberators can reduce the risk of alkalosis in the first hours, improving the utilization of N-NH3 at rumen level in beef cattle.

**Introduction**: Rumen bacteria can convert non protein nitrogen (NPN) sources into microbial crude protein if the amount of energy is available. Feed grade urea (FGU) is the most used NPN source in beef cattle diets (Cherdthong and Wanapat, 2010; Kertz, 2010). An *in vivo* study was conducted to determine the effects of feeding feed grade urea (FGU) or slow-release urea (SRU) as a replacement for true protein supplements (soybean meal, SBM), and control diet (CTR, no N inclusion sources) in beef cattle diets to see if N-NH3 concentration is reduced at the ruminal level during the first few hours, decreasing the risk of alkalosis.

**Material and methods**: Five beef cattle of 577 ±48. 75 kg live weight, provided with ruminal cannula, which were fed a conventional diet (concentrate/corn silage, 60: 40 as DM) and the following treatments were used, treatment 1, Control diet (Ctrl-without any N-additives), treatment 2, Soybean meal (SBM) as reference protein source (Ctrl-SBM); treatment 3, Urea-based diet, treatment 4, SRU Optigen-based diet (replacing Urea); treatment 5, SRU-Biuret based diet (replacing Urea); treatment 6, Urea with the inclusion of HyUrit at 25% of DMI (Urea+ HyUrit). Randomly distributed to one of six experimental treatments, in a 5x6 incomplete Latin square design, treatments. The diet was isoenergetic and isoproteic with 11.4 MJ ME/kg DM and 14 % CP. Each experimental period lasted 30d, of which 23 days were used for diet adaptation and five days for sample collection (intake and digestibility), the last two days were used for rumen dynamics testing (NH3 and pH) at 0 (just before feeding), 0.5, 1, 2, 4, 6, 8, 12, and 24 h after feeding. Each heifer received each treatment once during each of the six periods. Animals were weighed at the beginning and end of each experimental period. The additives were offered daily in a single dose at 08:00 h in the morning. Animal performance variables such as dry matter intake (DMI), digestibility, average daily weight gain (ADG), gain/feed ratio, chemical composition of the diets, ruminal fermentation profile and nitrogen utilization were considered.

**Results:** Mean live weight (568.7 ± 45 kg), mean daily weight gain (1.8 kg/d), DM intake (14.32 kg/d), OM intake (12.6 kg/d), NDF intake (8.15 kg/d) and ADF intake (3.53 kg/d) were similar among treatments (P>0.05), however, significant differences (P<0.001) were observed for dry matter digestibility coefficient, with SBM, Optigen and Biuret being superior to HyUrit, and the digestibility coefficient (P>0.05) for OM, NDF and ADF were similar among treatments. In the *in vivo* N-NH3 dynamics (mg/dl), HyUrit 25% shows the lowest N-NH3 concentrations (P<0.001), with respect to the rest of treatments, the highest N-NH3 concentrations for hours 0.5, 1 and 2 after feeding were for feed grade Urea, Optigen and Biuret followed by control and SBM diets.

Table 1. Values of *in vitro* ruminal ammonia (N-NH3,mg/dl*)* as a function of time and replacement of soy bean meal (SBM), feed grade Urea (FGU) and SUR sources in beef cattle on iso-protein and iso-energetic diets.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| N-NH3 | Control | SBM | FGU  | Optigen  | Biuret | HyUrit 25% | SEM | P value  |
| 0h | 9.83a | 7.37b | 3.68c | 4.21c | 6.20b | 1.52d | 0.328 | 0.0001 |
| 0.5h | 10.71c | 14.25c | 30.28b | 30.26b | 45.88a | 1.98d | 1.053 | 0.0001 |
| 1h | 12.42c | 14.73c | 29.02b | 30.75b | 38.88a | 7.98d | 0.957 | 0.0001 |
| 2h | 10.47d | 9.94d | 24.90a | 13.03c | 16.39b | 7.40e | 0.086 | 0.0001 |
| 4h | 1.08d | 3.85c | 16.72a | 5.08c | 8.14b | 3.96c | 0.353 | 0.0001 |
| 6h | 0.90d | 5.95b | 10.43a | 2.32c | 6.21b | 5.22b | 0.279 | 0.0001 |
| 8h | 0.86e | 5.41b | 3.91c | 1.96d | 6.53a | 5.74ab | 0.185 | 0.0001 |
| 12h | 1.00f | 4.03cd | 4.31c | 3.55d | 5.29b | 6.24a | 0.167 | 0.0001 |
| 24h | 0.93d | 5.15ab | 3.54c | 3.74c | 4.67bc | 6.08a | 0.274 | 0.0001 |

SBM, soya bean meal; FGU, feed grade urea

**Conclusion:** The addition of HyUrit25% diminish the release of N-NH3 in the rumen at concentrations below 8 mg/dl, which diminish the risk of ammonia intoxication compared to the addition of feed grade urea, Optigen and Biuret.

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