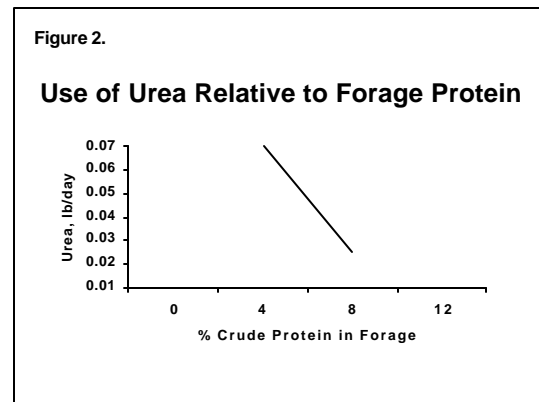
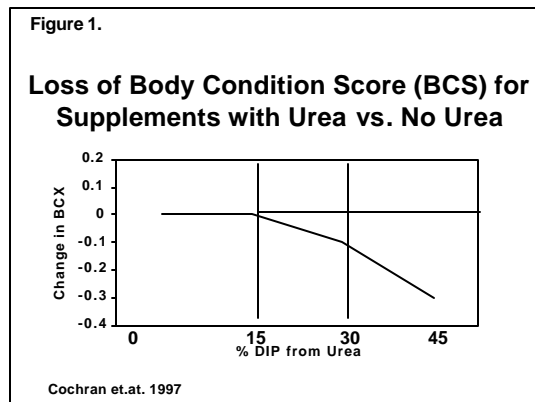


## Protein Supplementation of Low Protein Forage

Low protein forage is utilized by both lactating cows and stocker calves in mid to late summer when rainfall is lacking, causing growing forage to become dormant. Low protein forages are also utilized in fall and winter months as grazed forages (dormant range or stockpiled standing grass) and harvested forages. Protein supplementation is needed when the forage protein is too low to meet the cattle's requirement and/or in instances when forage intake must be stimulated. This article addresses supplementing beef cattle consuming forage that is abundant but low in crude protein (CP).

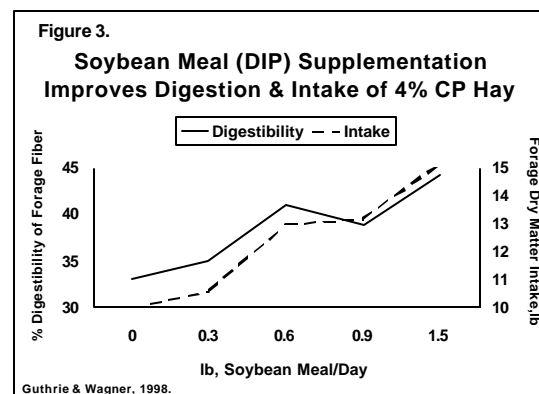
There are basically two types of protein: ruminally degraded intake protein (DIP) and ruminally undegraded intake protein (UIP or bypass protein). Supplemental DIP can be non-protein nitrogen (NPN) or natural protein (i.e. soybean meal, cottonseed meal). Supplemental UIP can have various compositions of amino acids and this composition can impact performance of young calves and lactating cows.

Research from Kansas State University has shown that only limited amounts of urea or NPN can be utilized in DIP supplements (Figure 1). Figure 2 is a generalization of the amount of urea that can be utilized with various levels of CP in forage. As forage protein increases, less urea can be used by the ruminant. Excessive NPN consumed during the breeding season can reduce fertility of cows. Forero et al. (1980) observed that slow-release urea and typical urea supplementation of cows resulted in reduced pregnancy rates compared to natural protein supplementation (50% for slow release urea, 65% for urea, 94% for natural protein). Cow/calf pairs and stocker calves (350 lb) gained less weight when urea was used as the protein in liquid supplements compared to Menhaden fish meal (White et al., 1997, 1998).



Supplemental DIP will stimulate forage intake by increasing forage digestibility when forage CP levels are low (Figure 3). In these cases, supplemental protein serves to increase both protein and energy intake by the ruminant. In most cases, supplemental starch from grains depresses forage intake because starch reduces the cellulose or fiber-digesting enzymes produced by ruminal microbes to digest forages (Bowman and Sanson, 1996).

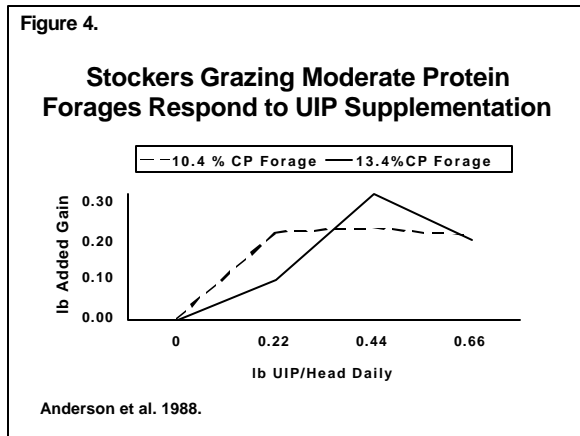
Stocker cattle research at Oklahoma State University demonstrates 1) .4 lb of added gain with supplemental DIP, an additional .3 lb of added gain when small amounts of supplemental energy are added to DIP, and 3) an additional .2 lb of added gain when ionophores are added. Additionally, Oklahoma State University research demonstrated that digestible fiber feeds with a low level of starch support greater gains than high starch feeds such as corn (Lusby and Kail, 1993).



In

2)

Stocker cattle under 600 lb will respond to UIP supplementation when they are grazing qualities of forages. If the forage is low in protein, DIP supplementation is still recommended. If the forage is over 8% protein small amounts of quality UIP are most effective (Figure 4). Table 1 shows the responses small calves (300-lb) have to a quality UIP source like Menhaden fish meal vs feather meal.



**Table 1.**

**Supplement Type Affects Forage Intake & Gain**

|                        | Rejected Supplement | Lasalocid Minerals | Feather | Fish |
|------------------------|---------------------|--------------------|---------|------|
| Forage DM intake, % BW | ---                 | 2.3                | 1.90    | 2.2  |
| Daily Gain, lb         | 1.14                | 1.30               | 1.50    | 1.83 |

← Mineral Ionophore Effect   ← Protein Effect   ← Protein Source Effect →

Ellis et al. 1995.

Lactating cows will respond to supplementation of quality UIP sources with improvements in fertility (Serrato-Corona et al., 1996). There is likely a hormonal response to key amino acids like methionine and lysine to hasten conception and improve calving rates. Part of the response to UIP supplementation is to improve body condition (Appednu et al., 1997).

Delivery of supplements is one of the most overlooked management items today. Cows in an extensive set of highly controlled studies were observed to have average intakes of free-choice minerals ranging from 0 to 1.98 lb daily. No more than 33% of the cows on any treatment consumed mineral on a daily basis (Table 2). Bowman et al. (1995) reviewed self-fed protein supplementation research and found that up to 20% of animals completely reject the supplements. Bowman et al. (1997) found 3-year old cows consume more liquid protein supplement than 2-year old cows and liquid supplement intake ranged from .37 to 5.6 lb daily with lick-wheel tanks. Table 1 shows the reduced performance observed when stocker calves reject a dry protein supplement.

**Table 2.**

**Variation in Free-Choice Mineral Intake**

| Mineral | Mineral Intake, lb/day |      |         | % of Cows Consuming Each Day |
|---------|------------------------|------|---------|------------------------------|
|         | Min.                   | Max. | Average |                              |
| A       | 0                      | 1.87 | .51     | 29                           |
| B       | 0                      | 1.98 | .39     | 18                           |
| C       | 0                      | .56  | .22     | 24                           |
| D       | 0.05                   | .82  | .27     | 33                           |

Cockwell et al. 1988.

The key to protein supplementation is to know what is needed and then accurately deliver it. Never feed more than one ounce of urea per head daily and only feed that much when the forage CP is less than 7%. Minimize the use of grains and high starch supplements and use digestible fiber sources when extra energy is needed. Use small amounts of a quality UIP source when protein is supplemented to lactating cows. Hand-feed supplements to cows 2 to 3 months pre-and post-calving when nutrient requirements are the highest and have the largest impact on performance (i.e. newborn health, rebreeding of the cow). Always hand-feed stocker cattle when protein supplementation is required.

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