

## Total Protein Requirements of Beef Cattle I: Feed the Bugs First<sup>1</sup>

---

Jeffrey N. Carter<sup>2</sup>

Beef cattle along with many other ruminant animals are unique in the animal kingdom because of their ability to utilize roughages, or fiber. Fiber, however, is not a nutrient. Nutrients include water, protein and/or amino acids, carbohydrates, lipids or fats, minerals, and vitamins. Energy is vital for all animals and is derived primarily from carbohydrates and to a lesser extent protein. Beneficial microbes, or “bugs,” live in the large compartment of the ruminant stomach known as the rumen and are capable of degrading fibrous components like cellulose (a component of all plants) into valuable nutrients such as protein and fatty acids for the animal. Therefore, the basic philosophy in formulating ruminant diets, including beef cattle is: feed the bugs first; provide them with the nutrients they need, and they will in turn provide for the animal. The rumen and its microscopic inhabitants are indeed what make beef cattle unique among livestock. Comparatively, there are more beneficial bacteria in the rumen of one cow than there are people on earth.

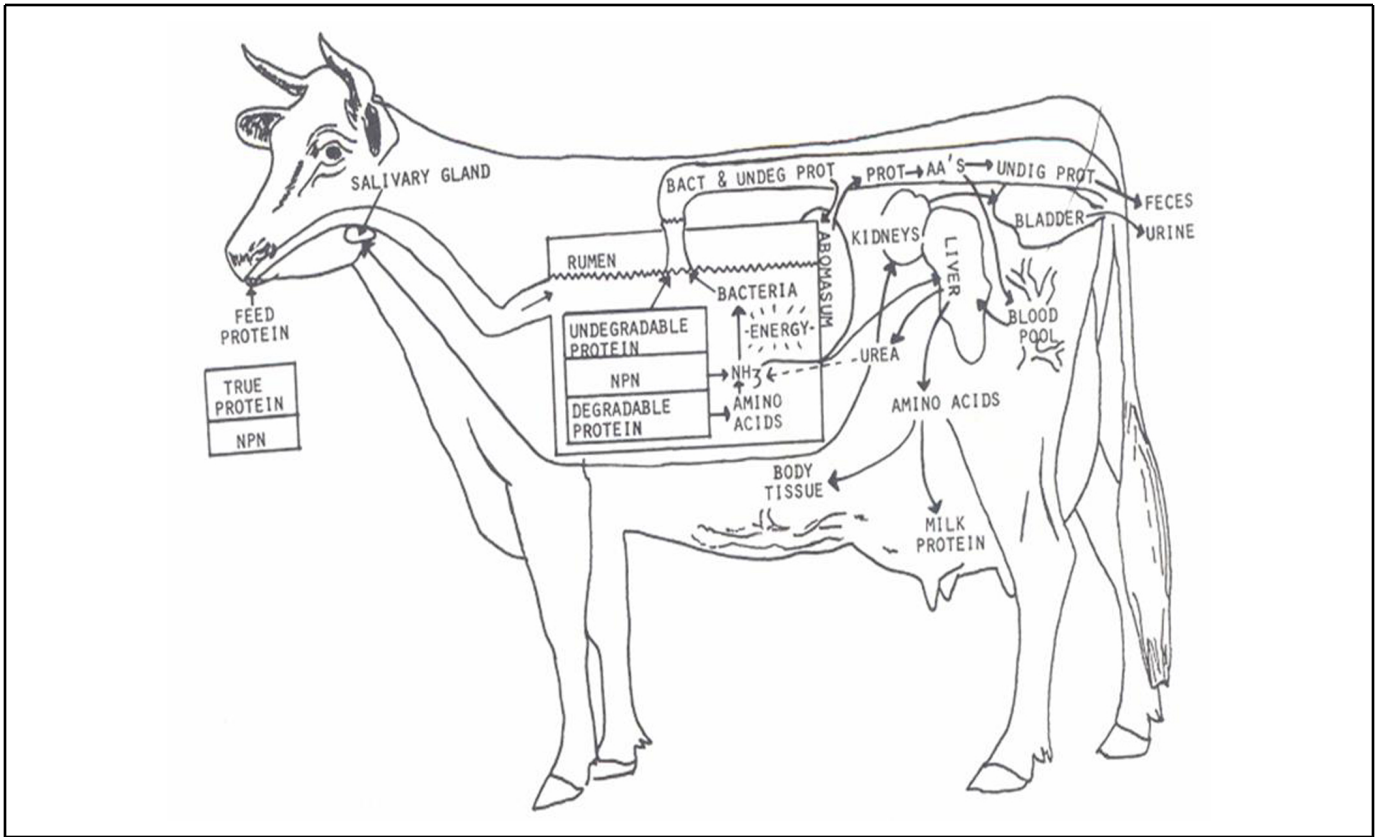
Ruminal bacteria or microbes provide the primary source of protein that will be used by the animal known as microbial crude protein (MCP).

Regardless of the feed protein provided – a manufactured protein supplement from the feed store, soybean hulls, corn gluten feed, liquid molasses with urea – ruminal microbes digest the protein in these feed ingredients, reassemble them and produce MCP. Theoretically, MCP has the ideal profile of amino acids necessary for growth and production. Even if no dietary source of protein is provided these bugs are capable of producing a source of protein – the animal harvests, or consumes the microbes which are a useful source of protein (equal to 20-60% crude protein themselves) to the animal. Finally, ruminants are also able to “recycle” certain nutrients including protein – the animal can survive on very low protein diets because of this mechanism. Nitrogen, a necessary ingredient for protein synthesis, is continually transferred from the bloodstream into the rumen where it is used by ruminal microbes once more.

---

1. This document is AN167, one of a series of the Animal Science Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Original publication date September 20, 2006. Visit the EDIS Web Site at <http://edis.ifas.ufl.edu>.

2. Carter, J.N., Assistant Professor of Animal Science, North Florida Research and Education Center Marianna, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, 32611.



**Figure 1.** This diagram depicts the path of dietary protein from consumption to digestion and absorption and even nutrient recycling in the lactating beef or dairy cow (adapted from *The Ruminant Animal: Digestive Physiology and Nutrition*. Prentice-Hall, Copyright © 1988).