



## West Central News

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# What Goes Into Making A Good By-Pass Protein?

Rumen microbial proteases and deaminases rapidly degrade protein and amino acids which are soluble in the rumen liquid phase. The degree of degradation of a protein source varies with the solubility of the proteins it is composed of and the length of time the protein is exposed to rumen microbes. The length of time a protein spends in the rumen decreases as feed intake increases – meaning a gain in bypass of the protein. For instance, about 58 % of the protein in SoyPLUS is expected to escape rumen degradation when feed intake is 2% of body weight and increases to 69% bypass when feed intake increases to 4% of body weight. Methods of decreasing protein and amino acid degradation in the rumen include heat treatment, chemical treatment (formaldehyde, sodium hydroxide), and encapsulation. It is important that the procedures used do not interfere with rumen microbe metabolism of other nutrients in the diet. The procedures utilized to improve rumen bypass must also not affect post-ruminal digestion of the protein. Heating proteins can change the tertiary structure so that they are much less soluble in the rumen and this greatly improves rumen

escape. Excessive heating causes the protein to remain insoluble and undegradable even in the small intestine. Heating also causes the proteins to form complexes with carbohydrates (Maillard reaction) that are resistant to microbial proteases. Unfortunately, lysine – an amino acid that is very hard to supply to the high producing dairy cow - tends to be among the most labile of amino acids due to its highly reactive amino group. When proteins interact with sugars, the complex product resists rumen degradation and, unfortunately, it may also be resistant to digestion within the small intestine. Soy protein is the best plant source of lysine. SoyPLUS utilizes a carefully controlled heating and cooling process to improve bypass of the soy proteins with minimal damage to the essential amino acids of soy protein. SoyPLUS proteins remain about 93% digestible in the intestine<sup>1</sup>. SoyPLUS also contains 5.5% fat, 50% of which is linoleic acid. About 1/3 of that fat has been shown to bypass the rumen giving added value to SoyPLUS<sup>2</sup>.

1. Stern, M.D., A. Bach, and S. Calsamiglia. 1997. J. Animal Sci. 75:2256.

2. Chalupa et al., Southwest Nutrition Conference Proceedings. Feb 21-22, 2002, Phoenix AZ . p 85.



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