Studies were conducted to determine the effects of feeding rumen undegradable protein (RUP) on subsequent feedlot cattle performance. The first experiment was conducted to determine if growth rate and gain to feed ratio (GF) could be improved in feedlot steers by balancing the diet for absorbable amino acid requirements. It was concluded from this research that animal performance could be improved when diets were formulated to meet the absorbable amino acid requirements. The removal of roughage and optimization of rumen undegradable amino acids (RUAA) in the feedlot diet led to improved gain efficiencies that could not be accurately described by net energy (NE) system calculations. The second study was conducted to determine the neutral detergent fiber (NDF) digestibility of concentrate diets in continuous culture and to determine if reduced fiber digestibility of high concentrate diets could influence net energy (NE) calculations, hypothesizing that reduced fiber digestion in high concentrate diets would account for diet NE discrepancies. The reduced NE value of fibrous feedstuffs, if adjusted, decreased the NE system’s ability to account for energy utilization by approximately 4%. A final study was conducted to determine the effects of dietary arginine level on subsequent feedlot cattle performance and efficiency. Dietary arginine levels were contrasted to test the hypothesis that diets could be formulated based on absorbable amino acid requirements. We concluded from this research that animal performance could be improved when roughage was removed and diets were formulated to meet the absorbable amino acid requirements. Dietary arginine level provided above the requirement resulted in no improvement in performance, thus providing evidence for the accuracy and reliability of empirical equations used to estimate the RUP essential amino acid flow from the rumen.