Public Abstract
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Title:Applying effective energy concept for intake prediction and balancing ruminal nitrogen and post-ruminal amino acid requirements for beef cattle

Feed efficiency is one of the top concerns for beef cattle industry. To achieve a maximal feed efficiency involves proper animal nutrition, which requires balancing nutrient supply to nutrient requirement. Accurate intake prediction is fundamental to diet formulation and appears simple but has historically been challenging to accomplish. NRC equations showed acceptable accuracies for intake prediction by beef cattle; however, accuracy has potential to be improved. Effective energy equations (EE) were proposed in this research, and compared with three NRC equations and net energy equations (NE). It was concluded that the EE equations more accurately predicted intake, had less variation and the greatest coefficient of determination (r2), and smaller line bias decomposition. The effective energy equations were the best for predicting intake by steers. For years, nutritionist formulated diet to meet animal protein and energy requirements. Ruminants could get 60% to 90% of their protein requirement from rumen microbial protein production. Instead of meeting animal's requirement, supplying adequate ruminal degradable nitrogen relative to fermentable carbohydrate when a better intake estimation is available to meet rumen bacterial requirements is superior principles to formulate diet. This research validated that animal feed efficiency was improved and maximized when diet was formulated by a model to meet but not exceed ruminal degradable nitrogen requirement and post-ruminal amino acid requirement. In addition, this research demonstrated roughage inclusion had negative impact on feed efficiency; concentrate-based feeding is the most efficient feeding system for finishing steer. Synchronization digestible carbohydrate and protein (nitrogen) in rumen is crucial in promoting efficiency without causing rumen disorder gastrointestinal tract health issues. In summary, implementing EE intake prediction in a diet formulation model to formulate diets with adequate but not exceeding ruminal degradable nitrogen to allow maximal microbial protein yield could improve steer feed efficiency.