Straight to the Bottom Line 12/01/12

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Title- The Art vs. Science of feeding dairy cows, part 2

In last month's column, we discussed the differences between the science and art of formulating diets for dairy cows. Looking at the past 100 years of progress in dairy nutrition indicates numerous advances in scientific knowledge. These advances have subsequently increased the complexity of this task. However, the art or long term experience value of building diets can not be ignored. Science hasn't answered all of the questions and also hasn't even been 100% correct in its attempt to fully explain the microbiology and biochemistry involved. So, we are left with this balance of art versus science.

Recent advances in dairy nutrition have yielded a new tool in our tool box. This tool is called for lack of a better term, a model. These biological models are an attempt to take numerous principles that are known to be true about how various combination of ingredient blend together, move through the rumen and have varying results of nutrient supply to the animal. As well, the models contain the best knowledge of the animal's requirements for various nutrients to meet the needs of differing growth, production and reproduction situations.

Computer programs that take ingredients and their respective content of various nutrients, blend them and compare them to animal requirements have been in place since the 1960's. Not long after that, the approach called linear programming was employed to not only do the math of the various combinations, but added the step of solving for the best or least cost blend of ingredients to meet the animals requirements. This application of a broadly used computer process in many applications in industry and science had a large impact on formulating animal diets. It took out the trial and error step of trying different blends and comparing them to animal requirements. It was smarter than the user behind the keyboard, but only in the science part of the task. It offered a risk of moving far away from the art of feeding cows, and fast! This new tool gave anyone that could run the program the ability to blend ingredients in the computer to meet nutrient specifications. Now for the first time, the art of feeding cows was set in competition with the science and math of the linear program. This fact is what gave the term least cost rations such a bad name in the animal feeding industry. In frequent instances, the computer reached a solution that met all of the nutrient requirements as set by recent science, but animal performance did not match the intended results. The chasm between art and science would grow even larger.

This new least cost liner programming capability was a ticking time bomb in the hands of feed companies, nutrition professionals and even producers. Anyone could buy this

software and set out to feed cows. The programs came loaded with common ingredients and various animal classifications and way you could go. Feed companies had license to utilize opportunity ingredients to still meet tag specs but reduce the cost to build the feed. Producers who had pretty good knowledge of the art of feeding cows began to dabble in least costing and often got into trouble forgetting cow health consideration while chasing production or forgetting some basic nutrition rules. Nutrition professionals were often guilty of chasing the math too far in either direction, depending on where they were receiving pressure from their bosses. So, the danger of the least costing linear program is that the math was always right, but the resulting blend was not always right for the animal.

As the industry moved though the next couple of decades, I think it became more proficient with this new tool and balanced the least cost mathematical build of a diet with the various needs of the animal. Linear programs are a great tool to build a workable diet when used with the correct ingredient and nutrient restraints.

But what are the shortcomings of this process? These programs are linear in nature and assume the same blending relationships of ingredients in all situations. They don't take into account the various interactions of ingredients blended in differing diets. Ingredients have impacts on each other in diets and these impacts may be different at different ratios and total amounts. The combinations and results are endless. In the linear programs, the resulting nutrient specifications and production support is simply a weighted average approach to blending. In short, 1+1 always equaled 2. As well, this linear math does not always predict what the rumen will do with these various blends. Better models have been built in recent years to attempt to predict these realities. In some diets, 1+1 might equal 2.5 an in other 1+1 might equal only 1.75! The newer dynamic models use newer science and complicated math to attempt to better predict results. In next month's column we will discuss more details on these newer dynamic models and how that have helped us better formulate for and predict actual performance.