Broiler Nutrition Efficency

Written By: Edward Diehl, Nutritionist – Cobb Europe

Introduction

We all want the best possible return while investing as little as possible: efficiency is the keyword to success and is becoming increasingly important. Not only in poultry, but in any sector varying from agriculture to software engineering. Efficiency comes in many forms and ranges from continuous improvement to a specific targeted improvement for one industry challenge. In poultry, the two go side by side. In the field of genetics, constant improvements are made to ensure an increase in efficiency in the next generation of chicks. Improvement in efficiency caused by innovations in the field of science and technology are less frequent, but equally important to the overall increase of efficiency. These science and technology improvements often concern the hatchery, farm, environment and feed aspects of the agricultural sector.

When considering resource efficiency and cost reduction in broiler feeds, the two most relevant points to focus on are energy and crude protein. Energy content in broiler feed rations is primarily driven by the goal of optimizing energy efficiency that is determined by the net energy broilers require in each stage of production. By focusing on the expected feed conversion of energy that the broiler has in each production stage, nutritionists can optimize available metabolizable energy in each ration (starter, grower, finisher) and thus allow broilers to be increasing more efficient during each state of growth and development. The latter is driven by the amino acid balance in the feed.

When the dietary crude protein is adjusted, there are several things that should carefully be considered. An example is the correct amino acid balance: this will increase performance and make better use of the available natural and synthetic amino acids. A second example is formulating with more alternative ingredients: this can result in a reduction of costs while increasing resource efficiency. Finding major points to improve on resource efficiency or cost in the future will be difficult and it will probably take quite some time.

There have been significant improvements in feed formulation associated with amino acid (AA) research that have greatly improved growth efficiency. For example, one of the first significant improvements in broiler nutrition dates back to the 1950s with the combination of linear programming for least-cost formulation and the usage of available synthetic amino acids. This innovative feed formulation revealed that feed costs could be reduced by supplementing methionine (Met), the first limiting amino acid for poultry. This was followed in the 1970's by supplementing diets with lysine (Lys), the second limiting amino acid for poultry, and in the 1990's with threonine (Thr) as the third limiting AA. There appears to be a trend spacing each discovery or improvement about 20 years apart; therefore, it is expected that the fourth limiting amino acid should be determined in the near future. There are three prime candidates for the fourth limiting amino acid: Valine (Val), Isoleucine (Iso), and Arginine (Arg).

The introduction of Valine and Arginine as synthetic amino acids has already led to a reduction of crude protein, which makes it more urgent for nutritionists to find the correct ratio of amino acids. Determination of the amino acid ratio (requirements) has shown inconsistencies in the results, some indicate, for example, a requirement of valine that resulted in a ratio of 80% valine to 100% lysine, and others show levels of 70%. Recent studies performed by the University of Arkansas and Cobb-Vantress have possibly revealed the reason for the inconsistencies. Reactions of broiler chickens to lysine, methionine and threonine has always been quite straight forward. For the fourth limiting amino acids it appears that there are delicate interactions amongst the candidates. Everything has been further complicated by the introduction of valine and arginine as synthetic amino acids, it has led to introduction of new possible candidates or additional limiting amino acids such as glycine and serine.

With the focus on the 4th limiting AA and other feed parameters to improve efficiency, the basic nutritional elements such as energy, protein and the first limiting amino acids are assumed to be static. Recent studies have shown that broilers respond differently compared to the expectation or historic data on, for example, energy. While the ongoing genetic improvement from year to year is unlikely to demand constant changes in the nutritional requirement of broiler chickens, over a decade a change in requirement could be expected. When compared to mammalian livestock such as pigs and cattle that are limited by long intervals for reproductive maturation and decreased quantity of offspring per dam and sire, the rate of genetic improvement for broiler chickens is exceptionally fast. There is no doubt that continued focus on genetics will result in broiler improvements including lower feed conversion ratios (FCR) and more efficient growth due to the bird's ability to more effectively utilize the feed ration provided. However, the poultry industry must also continue to focus efforts on the key aspects of energy content and crude protein in each stage of broiler diets. Energy and crude protein will continue to be the primary drivers for improving feed formulation in order to make advances in resource efficiency and cost reduction, and additional understanding of other limiting amino acids for poultry should help facilitate these improvements.

In the future, the focus of broiler efficiency in the poultry industry will continue to emphasize carcass yield and saleable meat while feeding the same primary ingredients (maize, wheat and soy) in poultry diets. Due to the poultry industry's interest in further improving the efficiency of broiler production, now is the time to re-evaluate the AA requirements for the modern broiler and to adjust feed formulations in each stage in production. But keep in mind that from an efficiency or economic point of view the basic nutritional elements will still have the biggest impact.