Low CP solution suggestion in China

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INTRODUCTION

The extension of low protein (LP) diets in the feed industry promotes a decrease in feed costs, environmental, health and welfare issues and an increase in N utilization with proper dietary formulation. These benefits will result in an improvement in environmental sustainability and marketability of the livestock industry. LP diets have the potential to contribute to the successful adoption of antibiotic free animal production, reducing predisposing factors to disease.

Low protein diets are usually formulated by reducing soybean meal inclusion and increasing inclusion of a range of supplemental crystalline essential amino acids, such as L-Met, L-Thr, L-Trp, L-Val, L-Ile, L-Arg to balance the digestible AA in intact protein. In order to achieve the widespread use of LP diets in the feed industry, several methods must be investigated.

One method of maintaining performance with LP diets involves using an ideal amino acid (IAA) ratio to ensure minimum amounts of AA are offered in the required quantities and ratios without overloading the gut with excess protein. The ideal protein is the most practical tool to express the AA requirements of animals. All IAA are expressed in ratio to Lys, as Lys is almost exclusively used for protein synthesis. By formulating on each IAA, the protein level will be adjusted automatically by least cost formulation. The requirement is defined as the minimal amount of the studied nutrient required to obtain the optimal or the maximal performance, assuming that all other nutrients are provided in adequate amounts.

Most customers supply Val and Arg to broiler diets, which SID VAL:LYS is about 78%, SID ARG:LYS is about 110%-115%. A study conducted by Belloir et al. (2017) found that the use of an ideal amino acid ratio described by Mack et al. (1999), with modifications to arginine and threonine, did not negatively affect performance in diet at 19% and 17% CP. The broiler performance of China customers also support the idea of Belloir et al. When CP decreases from 19 to 17% while balancing limited AA including Trp, Val, Arg will maintain the growth performance. In terms of Arg requirement, it depends on the nutrient composition and the farming conditions. Main factors affecting Arg requirement are the dietary Lys content, heat stress, coccidiosis, altitude and age.

In piglet AA nutrition, the interaction between BCAA is well described showing increased catabolism of Val and Ile when dietary Leu is in excess, reducing the availability of Val and Ile for protein deposition and growth (Wiltafsky et al., 2010). So there are some farms supply Ile to pig LP diets to meet SID Ile:Lys of about 55%. In piglet diets with blood products, the Ile requirement appears to be higher than the currently recommended values. Moreover, in broilers, Ile requirement is much higher (> 67% SID Ile:Lys) for breast meat deposition than for growth performance.

For layers, body composition, more specifically breast muscle and the abdominal fat pad, at the end of the rearing period of breeder pullets seems to play an important role in egg production, laying persistency, and fertility in the laying phase. Feed management by changing feed allowance or nutrient composition of the breeder pullet's diet during rearing period can alter body composition at the onset of lay. Adequate dietary protein is necessary to have optimum ovary development, and a certain fat position is required which can be used as an energy source for egg production and persistency. However, the optimum body composition at the end of rearing that will support the best egg production and persistency is not defined. In broiler breeder nutrition, major attention has been given to the number of saleable chicks per hen; however, maternal nutrition can also affect the performance of offspring by changing the nutrients deposited in the egg or via transgenerational epigenetics. Below recommendations for the diets will reduce breast weight and will increase abdominal fat pad in 0-22 weeks. Reduced of dietary CP by 1.5% tended to cause a higher production and total number of eggs in 22-64 weeks.

Methods of improving nutrient digestibility must also be considered. Protease is an enzyme which increases the digestibility of CP. Thus, protease must be considered in LP diets. Angel et al. (2011) maintained bird performance at 20.5% CP with addition of mono-

component protease at a minimum of 200g/MT. Use of insoluble fiber and intermittent lighting also improves gut health and function by increasing feed retention time in gastrointestinal tract. These materials and practices may also contribute to maintaining performance under low CP diets, although more work is required to investigate their effects on N digestibility.

The use of ideal amino acid ratios, crystalline amino acid supplements, proteases and gut enhancing materials and practices will contribute to the successful application of LP diets in the industry. Thus, it could be concluded that no minimum of dietary CP level is needed in feed formulation.

Table 1. The recommendation of amino acid profiles for broilers in China

Lys	100
Met+Cys	75 – 78
Thr	65 – 70
Val	78
Ile	67
Arg	105 - 115
Trp	18
His	40

Table 2. The recommendation of amino acid profiles for piglets in China

Lys	100
Met+Cys	58
Thr	68
Val	70
Ile	60
Arg	100
Trp	22
His	38