

CJ Products

L-Valine

| Introduction

| Trial report

- **The effect of graded levels of digestible valine : digestible lysine ratio on performance and carcass traits of male broilers fed low crude protein diets**
- **Effects of dietary valine : Lysine ratio on the performance, amino acid composition of tissues and mRNA expression of genes involved in branched-chain amino acid metabolism of weaned piglets**



Introduction

To lose weight, get in shape or simply to lead a healthier lifestyle, many people exercise or go on a diet; mostly do both. For a diet, people go to war with chicken breast, a high protein and low calorie diet. What makes protein so important?

Muscles are made up of proteins, and protein is made of amino acids. Therefore, proteins are needed to provide the amino acids to repair and regenerate damaged muscle tissue. After exercise, the body needs to maintain muscle mass for optimum health and adequate amino acid intake will help prevent muscle loss and increase muscle mass.

Of the ten essential amino acids, leucine, isoleucine and valine are named as branched chain amino acids (BCAAs). They work as key ingredients for both muscle protein synthesis and energy production. The BCAAs account for 35% of the essential amino acids in muscle proteins (Shimomura et al., 2004). Unlike other most amino acids, which are mostly metabolized in liver, BCAAs are primarily metabolized in muscle. They are key ingredients in muscle anabolism such as “muscle recovery and reinforcement” and at the same time BCAA supplementation decreases muscle catabolism which is to mobilize energy, so it prevents muscle loss (Fig. 1).

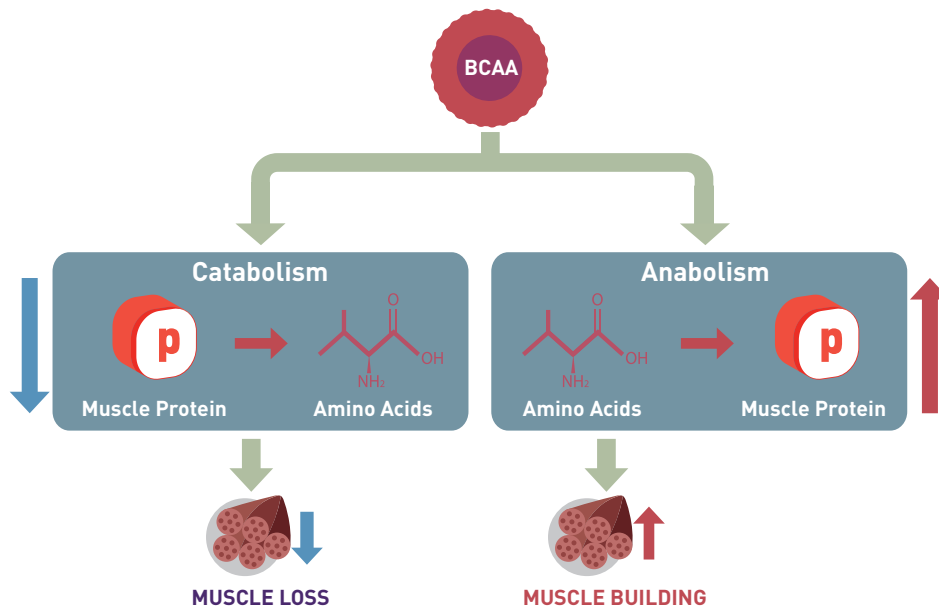


Fig. 1. Relationship between Muscle Metabolism and BCAA supplementation

Piglet : Advanced nutrition

In piglet nutrition, there is growing awareness that the inclusion of 70% digestible to lysine ratio is optimized growth performance and gut health.



Sow : Optimized performance

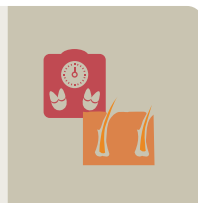
A sufficient supply of L-Valine is directly related to milk composition and piglet weight gain.



L-Valine Benefits

Broiler : Positive response

L-Valine improves growth performance and optimizes ADG and FCR by increasing body protein synthesis.



Layer : Increased productivity

L-Valine supplementation prevents body loss during production phase and improves egg production.

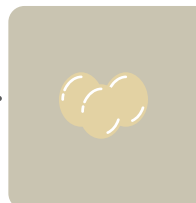


Fig. 2. Benefits of L-Valine usage in animal feed



CJ Trial report

The effect of graded levels of digestible valine : digestible lysine ratio on performance and carcass traits of male broilers fed low crude protein diets

Source : Schothorst Feed Research

Objective

Determine the optimal d.Val : d.Lys ratio for maximum growth, best feed efficiency, maximum breast meat weight and yield and lowest feed cost in male Cobb broilers from day 0-42 of age

Materials and Methods

- Experimental animals : 960 Cobb 500 Broilers (8 treatment * 6 replicates * 20 broilers)
- Age at arrival : One-day-old
- Starting date : 26th April, 2017
- Duration of the trial : 42 days

	T1 (NC)	T2	T3	T4	T5	T6	T7	T8 (PC)
d.Val:d.Lys	0.63	0.68	0.73	0.78	0.83	0.88	0.93	0.98
Rep / treatment	6	6	6	6	6	6	6	6
Broiler / Rep	20	20	20	20	20	20	20	20
Total	960							

Results

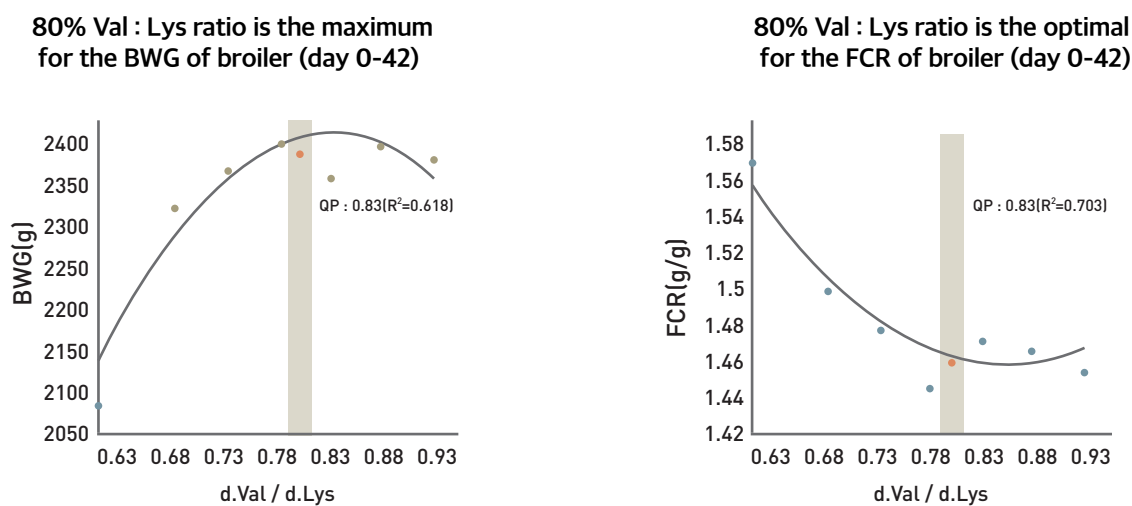


Fig. 1. Quadratic analysis of the test results

Conclusion

Valine has a wide range of physiological functions widely known, and as the importance of its function in foods and in swine feeds is growing, its usage is increasing accordingly. These functions of valine can play a very important role in broiler chickens as well. As mentioned in the text, when the ratio of valine to lysine is 80%, it is possible to maximize the potential productivity of broiler chickens and to help chickens maintain healthy condition.

In conclusion, for economic and environmental benefits it is very important to accurately evaluate the amount of valine used in the feed and to design a proper ratio.

References

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5. Zhang S, Qiao S, Ren M, Zeng X, Ma X, Wu Z et al. (2013) Supplementation with branched-chain amino acids to a low-protein diet regulates intestinal expression of amino acid and peptide transporters in weanling pigs. Amino Acids. 45:1191-205



CJ Trial report

Effects of dietary valine:lysine ratio on the performance, amino acid composition of tissues and mRNA expression of genes involved in branched-chain amino acid metabolism of weaned piglets.

Source : Asian-Australian J Anim Sci Vol. 31, No. 1:106-115 January 2018

Objective

The goal of this study was to investigate the effects of dietary standard ileal digestible (SID) valine:lysine ratios on performance.

Materials and Methods

- Total of 144 crossbred pigs (Duroc×Landrace×Large White) weaned at 28±4 days of age (8.79±0.02 kg body weight) were randomly allotted to 1 of 4 diets formulated to provide SID valine:lysine ratios of 50%, 60%, 70%, or 80%.
- Each diet was fed to 6 pens of pigs with 6 pigs per pen (3 gilts and 3 barrows) for 28 days.

	T1 (NC)	T2	T3	T4
d.Val:d.Lys	50%	60%	70%	80%
Pen / treatment	6	6	6	6
Pig / pen	6	6	6	6
Total		144		

Results

As the SID valine:lysine ratio increased, average daily gain (quadratically, $p < 0.05$), and the villous height of the duodenum, jejunum and ileum increased (linearly, $p < 0.05$). The concentrations of plasma α -keto isovaleric and valine increased linearly ($p < 0.05$), plasma aspartate, asparagine and cysteine decreased ($p < 0.05$) as the SID valine:lysine ratio increased. An increase in SID lysine:valine levels increased mRNA expression levels of mitochondrial BCAA transaminase and branched-chain α -keto acid dehydrogenase in the longissimus dorsi muscle ($p < 0.05$).

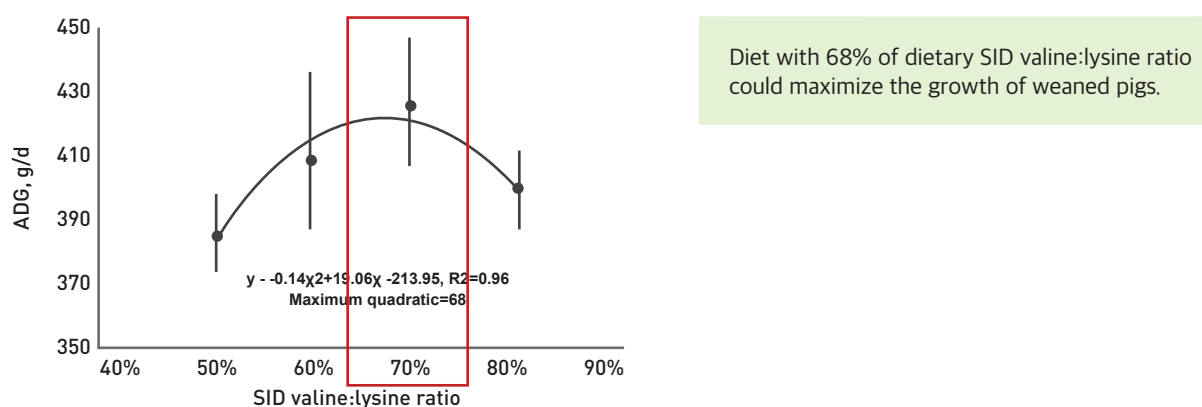


Fig. 1. Quadratic model of average daily gain (ADG) of weaned piglets plotted against standardized ileal digestible (SID) valine to lysine ratio

Table 1. Calculated analysis of Diet composition (as-fed basis)

Items	SID valine:lysine ratio (%)				SEM	p-value		
	50	60	70	80		Treatment	Linear	Quadratic
Duodenum								
Villous height (μm)	282.2	304.5	340	325.7	11.31	0.01	< 0.01	0.13
Jejunum								
Villous height (μm)	269.5	309.8	336	316.1	17.32	0.04	0.03	0.06
Ileum								
Villous height (μm)	243.2	267.75	303.4	281.6	14.45	0.04	0.03	0.11

At 70% of dietary SID valine:lysine ratio, the villous height of Duodenum, Jejunum, and Ileum was shown highest value.

Conclusion

Using a quadratic model, diet with a SID valine:lysine ratio of 68% showed the highest growth of weaned pigs, and the value (68%) was slightly higher than the level recommended by the National Research Council(NRC).