

# EFFECTS OF DIETARY SUPPLEMENTATION WITH HISTIDINE ON CARNOSINE AND ANSERINE CONTENT, PH AND DRIP LOSS IN PORK

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## I. INTRODUCTION

Carnosine and anserine are histidine containing dipeptides (HCD) naturally occurring in the muscles of vertebrate animals [1]. HCD have demonstrated valuable properties for human health as antioxidants, and hypotensive and cardioprotective molecules [1, 2]. In addition, the HCD content in meat has been positively related to quality parameters, such as pH, colour and water retention [3, 4]. Although an increase in HCD has been found in chicken muscles by supplementing the diet with the amino acid histidine [5, 6], no information about this effect has been described for swine. Therefore, the objective of this study was to evaluate the effect of supplementing histidine in the diet of fattening pigs on the muscle carnosine and anserine content, and on some meat quality parameters.

## II. MATERIALS AND METHODS

The experiment consisted of two treatments, a control diet (CON) and a histidine supplemented diet (HIS), with 1,220 animals per treatment. Animals received the same four feed formulas during the growing and finishing phase, based on barley, corn and soybean meal (0.37 His:Lys ratio), except that the pigs from the HIS group were supplemented with 3 kg per ton of L-Histidine HCl (BestAmino™ L-Histidine HCl – CJ BIO) (0.60 His:Lys ratio) during the last 12 weeks before slaughter. Animals were slaughtered at approximately 130 kg of final BW in 4 consecutive weeks (305 animals per treatment per week). At 24 hours post-mortem, samples from 12 CON and 32 HIS animals (n=3 and 8 per week respectively) were taken from the *Longissimus dorsi* (LD) and *Semitendinosus* (ST) muscles to analyse the carnosine and anserine content by HPLC following the method described by Barbaresi et al. [7]. Additionally, muscle samples of LD were taken from 100 animals per treatment (25 per week) to measure ultimate pH, drip loss according to Honikel [8], and intramuscular fat (IMF) by NIR (FOSS NIRS TM DS2500, 2018). Also, at 24 hours post-mortem, oleic acid content in the tip of the ham was measured by NIR (FOSS NIRS TM DS2500, 2018). Data were analysed using generalized mixed model of SPSS 29.0.0.0. Correlations were calculated using Pearson correlation.

## III. RESULTS AND DISCUSSION

The carnosine content was greater ( $P < 0.01$ ) in LD of HIS pigs compared with CON animals, whilst only a numerical increase was observed in the ST muscle (Table 1). Histidine supplementation increased ( $P < 0.01$ ) the pH in the LD muscle of pigs measured 24 h post-mortem, and lowered ( $P < 0.05$ ) drip loss. Conversely, no effect of dietary HIS supplementation was observed for anserine, IMF and oleic acid content. However, although the HCD content normally differs between muscles [9], the carnosine content in the LD was positively correlated ( $r = 0.664$ ,  $P < 0.01$ ) with the content in the ST muscle.

In line with previous research on pork [10], our results showed higher ultimate pH and lower drip loss in LD muscle when carnosine content was higher (HIS pigs). This might be explained by the buffering capacity of carnosine [10]. Interestingly, the anserine content was not affected by treatment, evincing

that the metabolism in swine for this HCD is not solely depending on histidine availability or carnosine content, and methyl donors might be limiting its synthesis, as described in poultry [11].

Table 1. Muscle HCD content and pork quality parameters for control (CON) and histidine supplemented (HIS) diets (mean  $\pm$  standard error)

Item	CON	HIS	P value
Carnosine, LD, mg/ 100 g muscle <sup>*</sup>	269 $\pm$ 7	307 $\pm$ 4	0.005
Carnosine, ST, mg/ 100 g muscle <sup>**</sup>	250 $\pm$ 8	274 $\pm$ 4	0.199
Anserine, LD, mg/ 100 g muscle <sup>*</sup>	5.36 $\pm$ 0.23	5.66 $\pm$ 0.14	0.502
Anserine, ST, mg/ 100 g muscle <sup>**</sup>	5.82 $\pm$ 0.28	6.10 $\pm$ 0.17	0.931
IMF, % <sup>***</sup>	5.11 $\pm$ 0.52	5.01 $\pm$ 0.56	0.553
Oleic acid, % <sup>***</sup>	44.1 $\pm$ 0.33	44.6 $\pm$ 0.17	0.352
Drip loss, % <sup>***</sup>	2.49 $\pm$ 0.19	1.96 $\pm$ 0.12	0.001
pH <sup>***</sup>	5.58 $\pm$ 0.03	5.68 $\pm$ 0.02	0.020

<sup>\*</sup> n=12 and n=32, <sup>\*\*</sup> n=8 and n=24, <sup>\*\*\*</sup> n=100 and n=100 for CON and HIS respectively.

#### IV. CONCLUSION

Dietary histidine supplementation in fattening pigs increased the muscle carnosine content and improved meat quality parameters, such as pH and drip loss.

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