



Effects of dietary nisin on growth performance, meat quality, antioxidant status, and microbial homeostasis in broilers

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The objective of this research is to explore the potential effects of different doses of nisin supplementation on the growth performance, meat quality, immune function, short chain fatty acid (SCFAs), and gut microbiota of broilers. Thus, 640 yellow-feathered broilers (initial body weight: 32.35 ± 0.13 g) at 1 d of age were randomly distributed into four groups (eight replicate pens per treatment and 20 birds per pen), fed with a basal diet with 0 (CON), 250 (N250), 500 (N500), and 1000 IU (N1000) nisin/g for 56 d. Nisin supplementation showed a quadratic increase in ADG from d 29 to 56 ($P = 0.040$) and d 0 to 56 ($P = 0.048$), and effectively increased the redness (a^*) ($P < 0.001$), significantly decreased the hardness ($P < 0.001$) and chewiness ($P < 0.001$) of breast muscles. The contents of serum immunoglobulin Y (IgY) at d 56 was significantly increased in the N500 and N1000 groups compared to the CON group ($P = 0.013$). Nisin significantly decreased the contents of interleukin- 1β (IL- 1β), IL-6, and tumor necrosis factor- α (TNF- α) ($P < 0.05$) in serum at d 28 and 56. Furthermore, nisin supplementation significantly increased the levels of acetic acid ($P < 0.05$) at d 28 and 56, and propionic acid ($P = 0.034$) at d 56 to enrich the SCFAs content. More importantly, the α -diversity was increased ($P < 0.05$) and the microbial structure were altered by nisin supplementation at d 28 and 56. Differential analysis and linear discriminant analysis with effect size (LEfSe) plots together showed that *Barnesiella* and *Lactobacillus* were enriched in the CON group, while other species, including *Bacteroides*, *Oscillibacter*, and f_Ruminococcaceae, were predominant in the nisin-supplemented groups. In conclusion, nisin supplementation in the diet showed little impact on growth performance, effectively increased the meat quality of breast muscles, and strengthened the immune and antioxidant functions as indicated by pro-inflammatory cytokines and antioxidant enzymes, increased the contents of acetic and propionic acids, and potentially changed the microbial composition of broilers. These findings suggest that nisin has the potential to be used as a natural dietary supplement for broilers.

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