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← Pak Vet J, 2017, 37(3): 335-339 →

Supplementation of Zinc Oxide Nanoparticles has Beneficial Effects on Intestinal Morphology in Broiler Chicken

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Abstract

The current study was aimed to investigate the effects of Zinc oxide nanoparticles (ZONP) supplementation on histomorphometry of small intestine and cecal tonsil in broilers. A total of 100, day-old chicks were randomly divided into four groups with five replicates per group, each having five birds. Birds were administered control (Basal diet), 80mg Zinc oxide (80ZnO), 40mg Zinc Oxide nanoparticles (40 ZONP), and 80mg Zinc oxide nanoparticles (80 ZONP)/kg diet for 35 days. The results showed a significant increase ($P<0.05$) in villus height (VH), and villus surface area (VSA) in all parts of small intestine of 40 ZONP supplemented birds. The villus width (VW) and villus height: crypt depth ratio (VH:CD) was also high ($P<0.05$) in duodenum and jejunum of 40 ZONP supplemented birds. In jejunum, the VH, VW, VSA and VH:CD were also increased ($P<0.05$) in 80 ZONP. The total goblet cell (GC) count was higher ($P<0.05$) in all three parts of small intestine in 40 ZONP group. However, GC containing acid mucin increased ($P<0.05$) in jejunum and ileum while GC containing mixed mucins increased ($P<0.05$) in duodenum and ileum of 40 ZONP group. In addition, GC containing acidic and mixed mucin and total GC count was also high in ileum of 80 ZONP group. The length, width, area and total number of lymphatic nodules of caecal tonsils were higher ($P<0.05$) in 40 ZONP. Supplementation of ZNOP at the dose rate of 40mg is a considerable feed additive for poultry with beneficial effects on intestinal and caecal tonsils micro architectural changes.

Key words: Goblet cell, Nanoparticle, Villus histomorphometry, ZINC oxide



ISSN 0253-8318 (PRINT)
ISSN 2074-7764 (ONLINE)

