Phosphorous Bioavailability: Is it Affected by Manufacturing Method?

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Phosphorous (P) is a key nutrient in animal production systems. In the beef industry, a primary source of P is through supplementation with mineral blocks. Within the industry, there has been significant conjecture that the method used to manufacture mineral blocks (hot versus cold pour process) could have a significant effect on P bioavailability. Anecdotal evidence suggests that mineral blocks manufactured using a hot pour process have a greater P bioavailability than those manufactured using a cold pour process. Thus the aim of this study was to determine if manufacturing method did affect P bioavailability in mineral blocks. A chick tibia bone assay (Fernandes et al. 1999) was used to determine bone mineral deposition and thus P bioavailability.

The investigation was carried out with 256 day-old male Cobb 500 broiler chickens over a period of 21 days. Eight chicks were allocated to a cage and each cage assigned to one of four treatments (eight replicate cages) in a completely randomized block design. The treatments consisted of four dietary groups: 1) Control group fed a standard broiler chick starter diet; 2) MBC group, fed a broiler chick starter with the inclusion of MaxiBreed® block - cold pour process; 3) MBH group, fed a broiler chick starter with the inclusion of MaxiBreed® block - hot pour process and; 4) PPA group, fed a chick starter with the inclusion of Phosphoric acid being the P source in the mineral blocks. Diets were formulated to equivalent nutrient (ME = 10.0 - 11.0 MJ/kg) and mineral levels (Available P = 0.49 - 0.50 g/kg). Body weight and feed intake were recorded on day 0 and at weekly intervals thereafter. On day 21, 3 birds per cage were euthanized, the tibia removed and the mineral bone ash content quantified. Samples of all diets and P sources from the 4 dietary groups were also collected and analysed.

The results indicated that the MBH supplemented diet increased weight gain and significantly improved ($P<0.0001$) FCR of birds compared with the control diet and significantly decreased ($P<0.05$) tibia bone ash percentage compared with all other diets. In contrast, the PPA supplemented diet significantly decreased ($P<0.0001$) body weight gain and resulted in less efficient feed conversion compared with all other treatment groups. The MBC supplemented diet resulted in a numerically lower weight gain and significantly impaired ($P<0.0001$) FCR compared with the control diet. No significant difference in tibia bone P content was observed in the four treatment groups.

Table 1. Growth Performance and Mineral (P) Analysis

	Control	MBC	MBH	PPA	SEM	p-value
Growth Performance						
Average weight gain/ bird (g)	678^{b}	658^{b}	699^{b}	580^{a}	16.0	0.000
FCR (g feed/ g weight gain)	1.52^{a}	1.71^{b}	1.50^{a}	1.85^{c}	0.046	0.000
Mineral Content (P)						
Tibia Bone (mg)	82.7	78.4	79.5	80.7	2.03	0.500
Dry weight (g)	1.07^{b}	1.00^{b}	1.02^{b}	0.92^{a}	0.03	0.004
Ash (%)	47.2^{b}	46.2^{b}	44.4^{a}	46.6^{b}	0.58	0.014

Values are least square means (n = 8). Values within a row not sharing the same subscript are significantly different.

Although significant effects on growth performance were observed, it is concluded that manufacturing method (hot pour process versus cold pour process) does not affect P bioavailability in mineral blocks. Furthermore, the chick tibia bone ash assay is a useful method in determining mineral availability.

Fernandes, J.I.M. et al (1999). *Poultry Sci*. **78**, 1729.

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