Rosenstein, D., Roberson, K.D., Waite, K., Nielsen, B., Klunzinger, M.W., Ledwaba, M.F. and Marks, B.P. (2000) ***Effect of increasing dietary calcium and phosphorus on bone development in growing turkeys.*** **In: Annual Conference. American College of Veterinary Radiology, November 28 - December 2, 2000, Chicago, IL.**

EFFECT OF INCREASING DIETARY CALCIUM AND PHOSPHORUS ON BONE DEVELOPMENT IN GROWING TURKEYS

D. Rosenstein[1], DVM, MS, K. Roberson[2], PhD, K. Waite[2], MS, B. Nielsen[2], PhD, M. Klunzinger[2], BS, M. Ledwaba[2], BS, B. Marks[3], PhD
Depts. of Large Animal Clinical Sciences[1], Animal Science[2] and Biosystems Engineering[3], Michigan State University, East Lansing, MI 48824

INTRODUCTION:

In the turkey production industry (IND), it is standard practice to feed higher levels of Ca and non-phytate Phosphorus (npP) than the National Research Council (NRC) recommendations, in order to promote the growth of a stronger skeleton. Elevated dietary npP leads to an increase in P content in the manure, which is undesirable due to resulting environmental contamination, particularly eutrification of the water. The purpose of this study was to determine the effect of varying concentrations of dietary Ca and npP on bone size, density and breaking strength in turkeys.

METHODS:

Turkey poults (870) were divided into 6 groups (5 replications of 29 birds/pen). All poults were fed a Ca: npP ratio of 1.8:1 at 0-6 wks then 2:1 until slaughter at 17 wks. From 3-17 wks, Ca and npP levels were varied between groups. At 3-9 wks, groups 1-3 were fed NRC Ca and npP levels then at 9-17 wks, these levels were adjusted: 1) low (75% of NRC); 2) NRC; 3) IND. At 3-9 wks, groups 4-6 were fed IND Ca and npP levels then at 9-17 wks, these levels were adjusted: 4) low (75% of NRC); 5) NRC; 6) IND. After slaughter, the tibiae were cleaned of soft tissues and computed tomography (CT) was performed with the bones positioned on a pad containing hydroxyapatite bone density standards. Image data were analyzed for cross-sectional area of total (TBA) and cortical (CBA) bone. Bone mineral density (BMD) was measured by quantitative CT (QCT). Bone strength was measured as the breaking load on the three point bending test. Linear regression ANOVA was used to examine data for treatment effects and to identify a relationship between CT bone measurement(s) and breaking strength.

RESULTS:

Mean values of bone size, bone mineral density and breaking strength were as follows:

GROUP	CBA (cm^2)	TBA (cm^2)	BMD (mg/cm^3)	LOAD (N)
1	.851	2.070	300.8	576.8
2	.884	2.076	304.3	552.7
3	.903	2.178	320.8	674.9
4	.833	2.019	302.0	559.8
5	.820	1.979	309.0	529.9
6	.889	2.102	313.7	595.4

There was no difference between treatment groups in bone size, BMD or breaking strength. A strong direct linear relationship was present between BMD and breaking strength (P= 0.0001) while CBA and TBA were not directly related to breaking strength.

CONCLUSION:

There was no evidence from this data that increasing Ca and npP above NRC recommendations benefited bone development in turkeys. A strong linear relationship was demonstrated between BMD, as measured by QCT, and bone breaking strength.