THE USE OF DUAL ENERGY X-RAY ABSORPTION TO DIAGNOSE PHOSPHOROUS DEFICIENCY IN CATTLE

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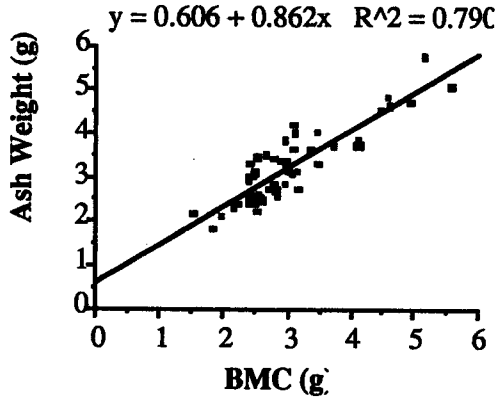
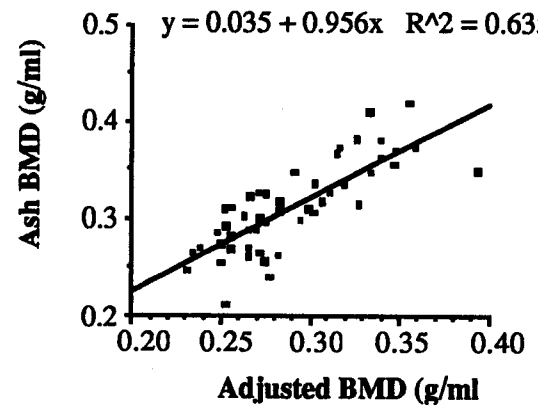
This study was undertaken to evaluate the suitability of Dual Energy X-Ray Scanner (DEXA) for determining bone mineral density (BMD) of tail bones in cattle as an indication of their phosphorous status. DEXA technology is used widely in human medicine to measure bone density for the detection of osteoporosis. Phosphorous deficiency results in poor growth, low reproduction, and high mortality rates (Shupe et al. 1988) and is associated with reduced bone mineral density (Little 1972).

Sixty five tails from cattle with widely differing nutritional histories were scanned using DEXA and then analysed using standard physical and chemical methods. The second to fifth coccygeal bones (C2-C5) were scanned and the C2 and C5 bones were analysed chemically. Estimates of bone mineral content (BMC), the area of each bone, and the bone mineral density (BMD) were obtained from the scanner. These data were then compared with actual volume of each bone, the ash weight, and the calculated density. The phosphorous content of the bone ash was also determined.





The following results are for the C5 tail bones. The BMC calculated by the scanner was closely related to the ash weight determined by chemical analysis (r^2=0.790)(see figure). The relationship between DEXA BMD and the ash bone mineral density (r^2=0.573) was not as good. This appears to be due to errors in estimation of the volume in the scanning process which only measures bone area. An adjusted BMD was calculated using the relationship between the scanned area and the measured volume ("scan volume" = -2.84 + 1.87 * scan area). This adjusted BMD versus ash bone mineral density gave an improved relationship (r^2=0.635)(see figure). BMD determined chemically was closely related to the phosphorous density of the bones (r^2=0.853).

These results indicate that DEXA may provide a useful technique for estimating BMD and phosphorous status in cattle.

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