

NORMAL URINARY MINERAL EXCRETION LEVELS IN AFRICAN ELEPHANTS (*Loxodonta africana*)

Michele Miller, DVM, PhD,¹ Jill N. Yoshizawa, DVM,^{2*} and Scott P. Terrell, DVM, Dipl ACVP³

¹Palm Beach Zoo, 1301 Summit Blvd, West Palm Beach, FL 33405 USA ;²Kailua Animal Clinic, 111 Hekili St #104, Kailua, HI 96734 USA; ³Disney's Animal Programs and Environmental Initiatives, 1200 N Savannah Circle, Bay Lake, FL 32830 USA

Abstract

Metabolic bone disease has occurred in several incidences of elephant neonates hand-reared on milk replacement formula. Monitoring for metabolic bone disease historically has been done through serum calcium and phosphorus concentrations. Serum concentrations are tightly regulated and changes in concentration are typically not evident until skeletal changes have already occurred. Urinary calcium and phosphorus excretion levels may provide earlier evidence of nutritional secondary hyperparathyroidism and allow intervention before development of severe and irreversible bony changes. Free-catch urine collection also offers a less-invasive and less-stressful alternative to blood collection, particularly when working with non-domestic species. In this study, we establish normal urinary mineral excretion values based on six healthy African elephants of various ages.

Six clinically-healthy African elephants (4 calves and 2 adults) from Disney's Animal Kingdom were used in this study. All calves had been, or currently were, raised in a cow-calf pair. Free-catch urine samples were opportunistically collected from the elephants and without restraint by the keeper staff. Samples were submitted to Antech Diagnostics (Antech Diagnostics, Inc., 1111 Marcus Avenue, Suite M-28, Lake Success, NY 11042 USA) for analysis. Nineteen urinary creatinine, calcium, and sodium concentration measurements were obtained, as were 18 phosphorus measurements. Calcium:creatinine and phosphorus:creatinine ratios were calculated to eliminate the flow rate factor in excretion values. The calcium:creatinine ratios ranged from 0.422 to 1.844, with a mean of 1.31 and no significant differences among ages. The phosphorus:creatinine ratios ranged from 0 to 2.227, with a mean of 0.213. The phosphorus:creatinine ratio was significantly higher for the two calves under 3 years of age (mean 0.636) versus the two older calves and two adults (mean 0.002).