

VITAMIN E SUPPLEMENTATION IN AFRICAN ELEPHANTS

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Abstract

Vitamin E, an essential vitamin, has antioxidant properties that are important for maintaining optimal health. In the 1990's, comparisons of zoo-housed and wild elephant species revealed concentrations of blood α -tocopherol (vitamin E) in zoo-housed elephants of approximately half that seen in their wild conspecifics (0.4 vs. 0.8 ug/ml; Dierenfeld and Traber, 1992). Addition of dietary vitamin E supplement for the adult African elephants housed at Disney's Animal Kingdom (DAK) was initiated in 2003 (2 to 6 IU/kg; water soluble α -tocopherol). We utilized longitudinal (1999 to 2014) serum vitamin E paired with age data (0 to 3.36 ug vitamin E/ml; 1.8 to 37.7 y old) from 18 elephants ($n = 12$ female; $n = 6$ males) housed at DAK to evaluate changes in serum vitamin E concentrations with age (elephants with no dietary supplementation), and the impacts of dietary vitamin E supplementation on serum values.

Decreases in serum vitamin E concentrations with age: A subset of data ($n = 159$ observations) were chosen for which no dietary vitamin E supplementation was reported in historical diet records. Serum vitamin E correlated negatively with age for 2 to 6 y-old elephants ($R^2 = -0.51$; $P < 0.001$), but not for 6 to >10 y-old animals ($R^2 = -0.089$; $P = 0.329$; PROC CORR, SAS). Serum vitamin E was highest ($P < 0.05$) in 2 y-old animals (1.5 vs. 0.4 to 1.0 ug/ml in animals 3 to >10 y-old), while serum vitamin E was lowest ($P < 0.05$) in 8 and >10 y-old animals (0.4 to 0.5 vs. 0.8 to 1.5 ug/mL in animals 2 to 4 y-old; PROC MIXED, SAS).

Dietary vitamin E supplementation & serum concentrations: Utilizing all the data ($n = 348$ observations), we determined that younger elephants (7 y-old and younger; no supplementation) had higher ($P < 0.01$) mean serum vitamin E (0.86 ± 0.14 ug/mL) compared to older elephants. Within older elephants (> 7 y-old), mean serum vitamin E was higher ($P < 0.01$) in elephants fed supplemented diets (0.70 ± 0.13 ug/mL; 2 to 5 IU/kg BW) versus those fed diets without additional supplementation of vitamin E (0.41 ± 0.13 ug/mL; 0 IU/kg BW; PROC MIXED, SAS). Mean serum vitamin E was not different ($P > 0.05$) than 0.8 ug/mL (*i.e.*, the value reported for wild elephants) for younger animals and older supplemented animals; while serum vitamin E of un-supplemented older animals was lower ($P < 0.01$) than 0.8 ug/mL (T-test, SAS). Dietary vitamin E supplementation has the potential to increase serum concentrations of zoo-housed African elephants to concentrations similar to those reported for their wild conspecifics; however, the physiological benefit of this has not yet been elucidated. These data indicate that the appropriate time to begin considering dietary supplementation of vitamin E for captive elephants is approximately 6 to 8 y-old. Necessity of supplementation should be determined by evaluating blood serum. Due to the high variability of serum vitamin E, low serum

concentrations should be confirmed. Post supplementation serum E should be evaluated to determine efficacy of dosage.

Literature Cited

Dierenfeld, E. S. Si Traber, M. G. (1992) Vitamin E status of exotic animals compared with livestock and domestics. In: Vitamin E in Health and Disease (Packer, L. & Fuchs, J., eds.), pp. 345-370. Marcel Dekker, New York.