RHABDOMYOLYSIS IN CAPTIVE PELICANS: CONFLICTING INDICATORS OF VITAMIN E STATUS

Kibby Treiber, PhD[1]* and Ann Ward, MS[2]

[1]Recreation and Open Spaces Department, Zoo Miami, Miami-Dade Parks, 12400 SW 152 St. Miami, FL 33177, USA
[2]Nutritional Services, Fort Worth Zoological Association, 1989 Colonial Parkway, Fort Worth, TX 76110, USA

Abstract

Captive pelicans are supplemented with vitamin E based on low levels in frozen fish diets, risk of rancidity, and requirements for other fish-eating species. Multiple incidences of captive pelican mortality have been observed (Nichols and Montali, 1987; Shivaprasad *et al*., 2002; Zollinger *et al*., 2002) associated with periods of stress and white-streaked muscles indicative of vitamin E deficiency. However, coagulopathy is another common finding in captive pelicans and is associated with vitamin E toxicity. At Fort Worth Zoo in 2012-2013 and at Zoo Miami in 2017, conflicting signs of vitamin deficiency and toxicity occurred simultaneously, as was previously published by Zollinger *et al*. (2002). Additional sampling was undertaken to better understand the vitamin E status of these pelicans. Serum values indicated normal to very high levels of circulating vitamin E (5-70 ug/mL; normal range 4-21 ug/mL; Schlegel *et al*., 2005; Ferguson *et al*., 2014) in birds prior to death. After reduction of supplementation, some brown pelicans maintained high circulating vitamin E for up to 2 years in, while other pelicans gradually returned to normal levels over several months. A number of pelicans showed spikes in circulating vitamin E during periods of stress or clinical signs despite consistent or no supplementation. Liver vitamin E values of deceased birds were normal to very high (59-705 ug/g dry tissue) compared to values for domestic chickens (45-120 ug/g dry tissue; Michigan State University Diagnostic Laboratory, 4125 Beaumont Road, MI 48910-8104) or carnivorous species (131-193 ug/g dry tissue; Ilyina *et al*., 2014). Vitamin E levels in damaged skeletal muscle were similar to very high (86-876 ug/g dry tissue) compared to values for carnivores (< 115 ug/g dry tissue; Ilyina *et al*., 2014), as were skeletal muscle levels published from pelican myopathy incidents (135-333 ug/g dry tissue; Shivaprasad *et al*., 2002; Zollinger *et al*., 2002). These findings may indicate the mobilization of vitamin E stores in response to muscle damage, possibly from stress rhabdomyolysis. Stress-related anorexia might also exacerbate mobilization of vitamin E from fat tissue stores. These findings may contraindicate vitamin E supplementation or treatment of pelicans.

Literature Cited

Ferguson LM, Norton TM, Cray C, Oliva M, and Jodice PG (2014) Health assessments of brown pelicans (*Pelecanus occidentalis*) nestlings from colonies in South Carolina and Georgia, USA. *J Zoo Wildl Med* 45(4):802-12.

Ilyina T, Baishnikova I, Belkin V, and Ruokolaynen T (2014) Vitamins A and E in physiological adaptation of mammals with different ecogenesis. *Acta Biol. Univ. Daugavy* 14(1):45-502.

Nichols DK and Montali RJ (1987) Vitamin E deficiency in captive and wild piscivorous birds. In: *Proceedings of the First International Conference on Zoological and Avian Medicine*,

Association of Avian Veterinarians and American Association of Zoo Veterinarians. Oahu, Hawaii. pp 419-421.

Schlegel ML, Miller M, and Valdes E (2005) A retrospective study evaluating vitamin E supplementation in pelicans and plasma alpha-tocopherol concentrations in pelicans, storks, and flamingos. In: Graffam W, Hellinga D, Maslanka M, Ward A, Eds. *Proceedings of the Sixth Nutrition Advisory Group Conference on Zoo and Wildlife Nutrition*, AZA Nutrition Advisory Group. Omaha, Nebraska. pp 1-7.

Shivaprasad HL, Crespo R, Puschner B, Lynch S, and Wright L (2002) Myopathy in brown pelicans (*Pelicanus occidentalis*) associated with rancid feed. *Vet Rec* 150(10):307-3011.

Zollinger TJ, Gamble KC, Alvarado TP, Levens G, Garner MM, and Raymond JT (2002) Rhabdomyolysis, steatitis, and coagulopathy in East African white pelicans (*Pelecanus onocrotalus*) and pink-backed pelicans (*Pelecanus rufescens*). In: *Proceedings of the American Association of Zoo Veterinarians*, American Association of Zoo Veterinarians. Milwaukee, Wisconsin. pp 111-114.