

THE ROLE OF NUTRITIONAL SUPPLEMENTATION ON SERUM MINERAL CONCENTRATION IN MANAGED STINGRAY POPULATIONS

Scott M. Williams, MS, Kathleen E. Sullivan, MS, PhD, Shannon Livingston, MSc, Eduardo V. Valdes, MSc, PhD, and Natalie D. Mylniczenko, MS, DVM, DACZM*

Disney's Animals, Science, and Environment, Bay Lake, FL 32830, USA.

Abstract

Iodine is an essential nutrient for normal thyroid function in shark and ray species. In closed aquarium systems, aqueous iodine is bound by ozonation, becoming non-absorbable iodate and necessitating the supplementation of iodine (Sherrill *et al.*, 2004). The most common supplementation method is through diet with commercial multi-nutrient tablets. Research has shown reproductive disease to be a widespread problem in aquarium-housed female southern stingray (*Hypanus americanus*), with 65% diagnosed as having developed moderate to advanced reproductive disease (Mylniczenko *et al.*, 2019). The most affected females were found to have increased serum iodine levels (Mylniczenko *et al.*, 2016). Elevated serum iodine has been documented in an aquarium managed group of southern stingrays, compared to managed and wild rays in natural sea water; while removal of supplementation returned animals to near-wild iodine levels (William *et al.*, 2017). These findings were replicated in two additional groups (*Taeniura meyeni* and *Himantura sp.*) with elevated and subsequent reduction in serum iodine with the removal of supplementation. Other serum micro-minerals, including cobalt, also fluctuated in response to changes in supplementation. In addition, we collected paired serum samples for each of eleven blackblotch rays (*Taeniura meyeni*) and demonstrated that 24 hours post supplementation administration showed the greatest serum iodine concentration, with a return to initial level by the 72-hour mark. These findings have led us to a more critical review of the broad application of mineral supplementation to these species. Understanding appropriate recommendations for efficient mineral delivery is critical to maximizing animal wellness and nutrition in stingray species under human care.

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Literature Cited

Mylniczenko ND, Sumigama S, Wyffels J, Wheaton CJ, Guttridge TL, DiRocco S, and Penfold LM (2019). Ultrasonographic and hormonal characterization of reproductive health disease in wild, semiwild, and aquarium-housed southern stingray (*Hypanus americanus*). *Am J Vet Res* 80(10): 931-942.

Mylniczenko ND, Wyffels J, and Penfold LM (2016) Progress in understanding reproductive disease in southern stingray (*Dasyatis americana*). In: *Proceedings of the 47th Annual International Association for Aquatic Animal Medicine Conference, IAAAM*. Virginia Beach, VA.

Sherrill J, Whitaker BR, and Wong GTF (2004) Effects of ozonation on the speciation of dissolved iodine in artificial seawater. *J Zoo Wildl Med* 35(3): 347-355.

Williams SM, Ardente AJ, Mylniczenko ND, Guttridge TL, Sullivan KE, Livingston S, and Valdes EV (2017) Impact of removing dietary supplementation on serum nutrient concentrations in a managed population of southern stingray (*Dasyatis americana*). In: *Proceedings of the 48th Annual International Association for Aquatic Animal Medicine Conference, IAAAM*. Cancun, Mexico.