NITRATE: A GOITROGENIC COMPOUND IN JUVENILE WHITE-SPOTTED BAMBOO SHARKS (*CHILOSCYLLIUM PLAGIOSUM*)

Alexis L. Morris,[1*] Ruth Francis-Floyd,[1] Heather J. Hamlin,[2] Barbara J. Sheppard,[1,3] and Louis J. Guillette Jr.[2]

[1]*University of Florida, Department of Large Animal Clinical Sciences, College of Veterinary Medicine Gainesville, Florida, 32610, USA*

[2]*University of Florida, Department of Biology, Gainesville, Florida, 32610, USA*

[3]*University of Florida, Department of Infectious Disease and Pathology, College of Veterinary Medicine Gainesville, Florida, 32610, USA*

ABSTRACT

Elasmobranchs susceptibility to goiter formation in captive environments has been well documented.[2,3,5] Until recently most public aquariums believed that the etiology of elasmobranchs goiter was nutritional and specifically caused by insufficient dietary iodine.[5] Recent studies have demonstrated that high environmental nitrate inhibits the ability of the thyroid gland to utilize available iodine, resulting in over stimulation of the thyroid gland by thyroid stimulating hormone and ultimately, development of goiter.[1,6] The objective of this study was to evaluate the effects of high environmental nitrate concentrations on thyroid function in juvenile white-spotted bamboo sharks (*Chiloscyllium plagiosum*). We hypothesize that exposure to elevated nitrate will manifest via, a) alteration in growth rate, b) development of a diffuse hyperplastic goiter, and c) decreased plasma thyroid hormone concentrations. In July 2008, ten juvenile C. *plagiosum* (80-150g) were divided into two treatment groups (n=5 per treatment), low nitrate (<1mg/L NO_3-N) or high nitrate (70mg/L NO_3-N), for 30 days in flow-through natural sea water system. Results indicate nitrate exposure did not affect growth rate (e.g. weight, length, and condition factor) in juvenile sharks during the study period. However, histological analysis of the thyroid gland in nitrate exposed sharks did demonstrate moderate to severe hyperplasia and hypertrophy of follicular epithelium, suggesting a disruption in normal thyroid hormone production may have occurred.[4] A quantification of plasma thyroid hormone concentrations may confirm that nitrate exposure in juvenile bamboo sharks has the potential to cause goiter in captive elasmobranchs. With increasing restrictions on water use, most modern aquaria operate as re-circulating systems, resulting in higher and more chronic nitrate exposure to their collections. Goiter is one of the most common health problems in captive elasmobranchs and this study suggests that nitrate exposure may be an important factor in the etiology of this disease.

Sample Abstract

ACKNOWLEDEMENTS

The authors wish to thank Drs. Denise Petty, Carla Phillips and Ms. Tina Crosby of the University of Florida - College of Veterinary Medicine, Dr. Peter Anderson, Director of the University of Florida Whitney Laboratory for Marine Bioscience, Dr. Alistair Dove and Ms. Helen Ellis of the Georgia Aquarium, and Mr. Jim Kinsler of Sea World Adventure Parks in Orlando, Florida. The authors thank the College of Veterinary Medicine, University of Florida for financial support of this project, and Sea World Adventure Parks for technical assistance.

LITERATURE CITED- Please number consecutively and follow the appropriate examples below

Journal article
Mainka SA, Zhang H. 1994. Daily activity of giant pandas at the Wolong Reserve. Zoo Biol 13:13–20.

Standard book
Voet D, Voet JG. 1990. Biochemistry. New York: John Wiley & Sons. 1223 p.
Book authored by organization
[ILAR] Institute of Laboratory Animal Resources. 1979. Animals for research: a directory of sources. 10th ed. Washington, DC: National Academy of Sciences.

Book chapter
Latinen K. 1989. Demography of chimpanzees in captivity. In: Heltne PG, Marquardt LA, editors. Understanding chimpanzees. Cambridge (MA): Harvard University Press. p 354–359.

Dissertation
Hoage RJ. 1978. Biosocial development in the golden lion tamarin. [dissertation]. Pittsburgh: University of Pittsburgh.

Conference proceedings
Dunn JL, Overstrom NA, St. Aubin DJ. 1996. An epidemiologic survey to determine factors associated with corneal and lenticular lesions in captive harbor seals and California sea lions. *IAAAM 27th Annual Conference Proceedings*, Chattanooga, TN; Pp. 108-109.

Sample Abstract