SERUM SURVEY OF VITAMINS A AND E IN SHARKS

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Abstract

Although sharks are known to have unique aspects of lipid metabolism, fat-soluble vitamin concentrations have not been widely reported in the literature. Serum or plasma samples were obtained from eight species of sharks: black-tipped (*Carcharhinus brevipinna*; n=1), bonnethead (*Sphyrna tiburo*; n=7), brown (*C. plumbeus*; n=16), bull (*C. leucas*; n=14), lemon (*Negaprion brevirostis*; n=30), nurse (*Ginglymostoma cirratum*; n=14), sand tiger (*Carcharias taurus*; n=45), and tiger (*Galeocerdo cuvier*, wild-caught only; n=3). With the exception of bonnethead sharks, circulating concentrations of both nutrients were considerably lower than expected compared with other carnivorous vertebrates. Vitamin A (measured as retinol) averaged 0.09 ± 0.02 (nurse sharks) to 0.24 ± 0.08 (bonnethead sharks) μg/ml. Vitamin E (measured as α-tocopherol; α-tocopherol was detected in some, not all species) ranged from 0.84 ± 11 (tiger sharks) to 17.10 ± 10.20 (bonnethead shark) μg/ml. For two species in which both free-ranging and captive animals were sampled (bull shark [BS], n=3 free-ranging and 11 captive; lemon shark [LS], n= 22 free-ranging and 8 captive), differences between populations were not consistent. Vitamin A was higher in free-swimming BS compared to captives (0.20 vs. 0.11 μg/ml; $P < 0.05$) but did not differ in the LS populations (0.13 ± 0.05 μg/ml). Conversely, vitamin E concentrations were higher in captive LS compared to free-ranging animals (2.87 vs.1.59 μg/ml; $P < 0.05$), but did not differ between populations of BS (5.74 ± 2.18 μg/ml). Expected circulating concentrations for these nutrients in other carnivorous species range from about 0.2 – 1.0 and 10 – 30 μg/ml (retinol and α-tocopherol, respectively).

In other studies with marine vertebrates, polyunsaturated fatty acids may have contributed to rapid oxidation of vitamins A and E, necessitating separation of serum or plasma from cells within 20 minutes to avoid misleading (low) results.[2] No special handling was employed when samples were taken at various facilites, although samples displaying higher circulating levels in this study were processed more rapidly compared to the lowest values (and those collected from free-swimming sharks). Another confounding factor in captive facilities may relate to dietary supplements. Whole fish have been shown to contain adequate levels of vitamin A for piscivorous species[1] without a need for addition of this nutrient. High levels of vitamin A have been shown to interfere with absorption of vitamin E in other species. The facility with animals displaying the lowest circulating concentrations of vitamin E used supplements containing high levels of vitamin A, compared with two other facilities that supplemented with only additional vitamin E and no vitamin A. Differences among and within species may be due to sample handling, natural dietary habits and physiology, and/or supplementation regimes but require further study to determine correlative relationships.

LITERATURE CITED

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