NOTES

Distribution of Vitamin B-12 in Some Fishes and Marine Invertebrates

Vitamin B-12 is an important water-soluble vitamin. It is effective in correcting the abnormal blood pattern and neurologic symptoms of pernicious anemia. Vitamin B-12 is of microbial origin and is present in varying amounts in animal tissues and products. Literature shows that the information is scanty on the occurrence of Vitamin B-12 in Indian fishes. Earlier, Sreeniwasmurthy *et al.* (1955) reported Vitamin B-12 in five genera of fresh water fishes. Banerjee & Chatterjee (1963) have reported the Vitamin B-12 content of fifteen different varieties of fish from Bengal. The present note reports the distribution of Vitamin B-12 in the skeletal tissues and internal organs of several fish species and marine invertebrates.

Fresh samples of marine fishes and invertebrates were collected from Sasoon dock and Versova landing sites. Fresh water fishes were collected from Thana lake. Anterior dorso-lateral white muscle, red muscle and internal organs such as liver, heart and brain of each fish were collected for the assay of Vitamin B-12. Vitamin B-12 was extracted from the tissues at pH 4.5 in the presence of potassium cyanide (AOVC, 1966). The homogenate was diluted appropriately and assayed microbiologically using *Euglena gracilis z* strain as the test organism, the method employed being essentially as described by Guttman (1963). The values of Vitamin B-12 are expressed as microgram per 100 g of fresh tissue.

Table 1 reports the distribution of Vitamin B-12 in the skeletal muscle of several marine and fresh water fishes and marine invertebrates. It is observed that Vitamin B-12 content of white muscle of various fishes varies between 0.05 and 1.5 μg. On an average, it contains 1 μg of Vitamin B-12. The elasmobranch fishes such as sharks and rays have comparatively lower amounts of Vitamin B-12. It is interesting to note that the muscle of electric ray, *Narcine timlei* does not contain any detectable amount of Vitamin B-12. It is observed that marine and fresh water teleosts do not differ significantly with regard to their B-12 content. Marine invertebrates such as prawns, crabs, lobster, cuttle fish and squilla have comparatively higher concentrations of Vitamin B-12. Significantly higher concentrations are observed in case of prawn, *Matapenaeus brevicornis* (3.2 μ g) and crabs (6 to 12 μ g)

Table 2 summarises the distribution of Vitamin B-12 in the red muscle, heart, brain and liver of various fishes. Vitamin B-12 content of the red muscle varies between 3 to 22 μ g. On an average it contains about 8 μg of Vitamin B-12. The values indicate that heart is a rich source of Vitamin B-12. In sharks, rays, seer fish and horse mackerel, Vitamin B-12 contents of heart and liver are comparable. It is seen that Vitamin B-12 content of fish brain varies from 1 to 15 μ g with an average of about 4 μg.

The results show that internal organs and red muscle are richer sources of Vitamin B-12. It is evident that Vitamin B-12 content of red muscle is similar to that of liver and is richer than the white muscle. The fishes such as Indian mackerel, horse mackerel and other pelagic fishes which have greater proportion of red muscle are potentially richer sources of Vitamin B-12. Chatbar & Velankar (1977) have recorded higher concentration of another B-group vitamin, pantothenic acid in pelagic fishes.

An interesting observation is made from the present investigation. Comparing the occurrence of Vitamin B-12 in liver,

Table 1. *Vitamin B-12 content in fish skeletal muscle (μ g/100g)*

Species	Vitamin B–12
Scoliodon sorrakowah (Shark)	1.10
Sphyrna zygaena (Shark)	0.50
Trygon zugei (Ray)	0.21
Narcine timlei (Ray)	Nil
Harpodon nehereus (Bombay duck)	0.15
Eleutheronema tetradectylum (Salmon)	0.25
Muraenesox telabon (Eel)	8.15
Liza parsia (Mullet)	0.85
Psettodes erumei (Flat fish)	0.10
Parexocoetus brachypterus (Flying fish)	0.60
Hilsa illisha (Shad)	2.25
Hilsa toli (Chinese herring)	0.65
Sardinella fimbriata (Sardine)	1.70
Coilia dussumieri (Anchovy)	0.80
Rastrelliger Kanagurta (Indian mackerel)	2.75
Cybium guttatum (Seer fish)	2.00
Pampus argenteus (Silver pomfret)	0.45
Parastromateus niger (Black pomfret)	0.85
Megalaspis cordyla (Horse mackerel)	3.15
Caranx sansum (Travelly)	1.12
Scomberoides lysan (Mackerel)	0.35
Otolithus argenteus (Doma)	0.48
Arius macronotacanthus (Cat fish)	0.25
Oseogeneiosus militaris (Cat fish)	1.50
Cyprinus carpio (Common carp)	0.80
Cirrhina mrigala (Mrigal)	0.18
Catla catla (Indian carp)	0.05
Cehla bacaila (Chela)	2.30
Clarias batrachus (Cat fish)	3.25
Labeo rohita (Rohu)	0.50
Penaeus semisalcatus (Prawn)	0.55
Metapenaeus dussumieri (Prawn)	1.25
Metapenaeus brevicornis (Prawn)	3.20
Metapenaeus monoceros (Prawn)	0.70
Scylla serrata (Crab)	0.85
Charybdis enicials (Crab)	6.10
Charybdis lucifera (Crab)	12.10
Thenus orientalis (Lobster)	0.90
Sepia (Cuttle fish)	1.10
Squilla sp.	3.00

red muscle and white muscle of Indian fishes with the data given by Higashi (1961) for Atlantic and Pacific ocean fishes, it is seen that the Indian fishes have similar values as those of Pacific ocean fishes, whereas the Atlantic ocean species have higher concentrations of Vitamin B-12. Such geographical differences are encountered with regard to other minor chemical constituents of fish, the reason for which are not known at present. Thus fish and marine invertebrates are good sources of Vitamin B-12.

Table 2. *Vitamin B-12 contents of various organs and red muscle in fish (μ g/100 g)*

Species	Heart	Brain	Liver	Red muscle
Chilloscyllium indicum (Shark)	1.35	0.80	5.80	...
Scoliodon palsorah (Shark)	4.50	1.00	6.40	...
Sphyrna zygaena (Shark)	7.50	2.50	1.50	...
Rhynchobatus djeddensis (Shark)	5.00	1.75	16.50	...
Himantura bleekeri (Ray)	...	3.20	8.50	...
Narcine timlei (Ray)	5.75	4.75	8.50	8.50
Chirocentrus dorab (Wolf berring)	16.50	1.20	11.50	...
Cybium guttatum (Seer fish)	..	15.00	22.50	22.50
Megalaspis cordyla (Horse mackerel)	9.50	5.00	8.00	17.50
Scomberoides lysan (Mackerel)	7.50	1.10	7.25	4.70
Mene maculata (Moon fish)	..	3.50	2.50	2.50
Otolithus argenteus (Doma)	5.50	3.50	0.80	..
Cyprinus carpio (Common carp)	10.40	6.00	7.00	4.70
Cirrhina mrigala (Mrigal)	16.00	8.50	3.75	3.00
Catla catla (Indian carp)	9.00	2.40	6.00	5.50

References

AOVC (1966) *Methods of Vitamin Assay.* Hand Book of the Association of Vitamin Chemists, 3rd edn., p. 257, Interscience Publishers, New York

Banerjee, D.K. & Chatterjee, J.B. (1963) *J. Ass. Physns India.* **11,** 983

Chhatbar, S.K. & Velankar, N.K. (1977) *Fish. Technol.* **14,** 165

Guttman, H. N. (1963) In *Analytical Microbiology* (Kavanagh, F., Ed) p. 257, Academic Press, New York

Higashi, N. (1961) In *Fish as Food.* (Borgstrom, G., Ed) Vol. 1, p. 441, Academic Press, New York

Sreeniwasmurthy, Swaminath, M. & Subramanian, V. (1955) *Indian J. Physiol. all. Sci.* **9,** 33

Central Institute of Fisheries Education, Bombay

*S. K. CHHATBAR
&
N.K. VELANKAR

*Present address: Export Inspection Agency, Bombay