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INCIDENCE OF HISTAMINE IN MARINE FISHES SOLD IN RETAIL MARKETS IN RELATION TO THEIR CONTENT OF HISTIDINE DECARBOXYLATING BACTERIA*

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ABSTRACT

Histamine contents in 10 species of marine fish collected from retail markets in Cochin were estimated along with their bacterial profile in general and content of histidine decarboxylating bacteria in particular. The study reveals that none of the fish samples surveyed contained histamine above 1.3 mg/100 gm fish which is much below the recommended level as per U.S.F.D.A. specification, even though the histidine decarboxylating bacterial counts were of the order of 10^4 per gm of fish muscle.

INTRODUCTION

HISTAMINE is a toxic degradation product of the amino acid histidine. Scombroid fishes such as tuna and mackerel and certain non-scombroid fishes possess large amounts of free histidine in their muscle tissues. Histamine formation in fish and fish products is brought about by the bacterial enzyme, histidine decarboxylase and to a lesser extent by autolytic degradation (Kimata, 1961 ; Anon., 1987).

Considering the severity of histamine poisoning, regulatory measures in fish and fish products have been imposed by countries such as Canada, Federal Republic of Germany, U.S.A., Finland, Denmark and Sweden. Table 1 shows the regulatory limits for histamine prescribed by these countries.

Even though extensive work on histamine formation in scombroid and non-scombroid fishes have been carried out in many countries, only limited work has been reported from India. In the present studies an attempt has been made to investigate how far the fishes sold through the retail outlets in India are safe with respect to histamine content as well as their content of histidine decarboxylating bacteria.

TABLE 1. *Regulatory limits for histamine in fish and fishery products*

Country	Limit of histamine mg/100 g fish
U.S.A. (for albacore, skipjack, yellowfin tuna and mahi-mahi) ..	20 max. level 50 Hazard action level
Canada ..	10 Representative of decomposition
F.R. Germany ..	20 Representative of decomposition
Denmark ..	30 Hazard action level
Sweden ..	20 Hazard action level

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MATERIALS AND METHODS

Marine fishes were collected from the retail markets in Cochin. The fish muscle was analysed in the laboratory for histamine content and their bacterial profile including histidine decarboxylating bacteria. Histamine was estimated by the method of Hardy and Smith (1976) using spectromic 21 spectrophotometer for measuring the absorbance.

The total viable bacterial count (TPC) was determined by using tryptone glucose agar (TGA). The plates were incubated at $28 \pm 2°C$ (RT) for 48 hours and counts taken. The total coliforms were determined using Desocycholate lactose agar (DLA), *Escherichia coli* using Tergitol-7 agar, faecal streptococci using KF agar and coagulase positive staphylococci using Baird-Parker agar (FDA, 1973 ; Difco, 1971). Histidine decarboxylating bacteria (HDB) was determined by direct plating of the fish tissue with tryptone-yeast extract-histidine agar (TYMA) of Neven *et al.* (1981).

RESULTS AND DISCUSSION

All the fish species analysed were more or less in prime condition and none had a bacterial count of more than a million/gram muscle. Detailed bacterial quality of these fishes are presented in Table 2.

The histamine contents of the individual fishes, in relation to their histidine decarboxylating bacteria counts are presented in Table 3. The population of histidine decarboxylating bacteria in the muscle of these fishes varied from 40/g in seerfish to 1.12×10^4/g in Malabar herring. But the content of histamine in the flesh of these fishes was less than 1 mg/100 g in almost all samples analysed. Further, no direct correlation was observed between the histamine content in fish muscle and their population of histidine decarboxylating bacteria.

The histamine content of all the fish samples surveyed were very small, less than 1.3 mg/100 g fish muscle which is quite insignificant to cause any histamine poisoning to the consumer.

TABLE 2. *Bacterial quality of fishes*

Fish	TPC per g	Total coliforms per g	*E. coli* per g	Coagulase +ve staphylococci per g	Faecal streptococci per g
Jewfish (*Otolithus* spp.) ..	7.64×10^5	7.85×10^2	Nil	208	9.03×10^2
Indian mackerel (*Rastrelliger kanagurta*)	6.93×10^5	7.88×10^2	277	Nil	4.67×10^2
Carangid (*Chorinemus* spp.) ..	4.30×10^6	6.00×10^3	55	3×10^2	2.50×10^2
Malabar herring *Thrissocles* spp. ..	1.39×10^6	1.03×10^4	1.8×10^4	47	3.82×10^3
Silverbelly (*Leiognathus* spp.) ..	4.75×10^5	2.90×10^5	583	4.25×10^3	8.17×10^2
Kilimeen (*Nemipterus japonicus*) ..	1.95×10^6	2.48×10^4	522	Nil	5.56×10^2
Seerfish (*Scomberomorus* spp.) ..	5.50×10^4	1.90×10^2	Nil	17	47
Carangid ..	1.17×10^5	1.14×10^3	200	90	2×10^2
Lactarius (*Lactarius lactarius*) ..	1.102×10^6	7.76×10^3	Nil	Nil	1.29×10^4
Ribbonfish (*Trichiurus* spp.) ..	4.7×10^6	5.30×10^2	18	1.4×10^3	400

TABLE 3. *Histamine content of individual fishes of each species in relation to their content of histidine decarboxylating bacteria*

Fish		Histamine content mg/100 g fish muscle				Histidine decarboxylating bacteria/g
		1	2	3	4	
Jewfish (*Otolithus*) spp.	..	0.15	0.06	0.15	0.41	3.26×10^{3}
Indian mackerel (*Rastrelliger kanagurta*)	..	0.20	0.14	0.42	0.29	2.18×10^{3}
Carangids (*Chorinemus* spp.)	..	0.88	0.25	0.81	1.30	4.40×10^{3}
Malabar herring (*Thrissocles* sp.)	..	0.49	0.18	0	0	1.12×10^{4}
Silverbelly (*Leiognathus* spp.)	..	0.30	0.20	0	0	6.4×10^{3}
Kilimeen (*Nemipterus japonicus*)	..	0.18	0.16	0	0	196
Seerfish (*Scomberomorus* spp.)	..	0.53	0.38	0	0	40
Carangid	..	0	0	0	0	90
Lactarius lactarius	..	0	0	0	0	3.85×10^{3}
Ribbonfish (*Trichiurus* spp.)	..	0	0	0	0	2.0×10^{4}

This observation is typical of fresh fish and fishes stored at low temperature (2 to 10°C) for periods 3 to 12 days (Salguero and Mackie, 1979 ; Pan and James, 1985 ; Ames *et al.*, 1987). However, there was incidence of histidine decarboxylating bacteria in all the samples analysed. This shows that the bacterial activity had not been enough to degrade the histidine in fish muscle to histamine in sufficient quantities. Hence, it is assumed that fish sold in the markets are safe from the point of view of histamine poisoning.

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