

# Indonesia

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## 1. Introduction

In the recent years, international trade for fish and fish products has been hampered by various tariff and non-tariff barriers particularly on the standards of quality, hygiene and safety of products. Therefore, efforts to improve the quality and safety of the products as well as to ensure the compliance with international standards are highly imperative. Such efforts will enhance market access and competitiveness in the international market and more importantly, it will also help to boost and stabilize the production and marketing of fish products.

Total production of Indonesian fish and fish products over the period of 2000 to 2005 has increased steadily, from 4,875,649 tonnes in year 2000 to 5,452,651 tonnes in year 2005, by volume, with an average increase of 3.51% annually.

Indonesia has been involved in the Japanese Trust Fund II Project to participate in the regional survey on chemical contaminants such as histamine in fish and fish products especially in scombroidae fish species.

Under the Indonesia Food Law No. 7/1996 and Fisheries Law No. 31/2004 as well as Government Regulation No. 28/2004 pertaining to Food Quality, Safety and Nutrition; it was clearly stipulated that all food products including fish and fish products put in the market place intended for human consumption shall comply with the prevailing laws and regulations, to ensure that the products are safe and shall not pose any threats to human health.

With the above laws and regulations, it is imperative to formulate the Ministry of Marine Affairs and Fisheries Decree, and clearly define the important requirements to guarantee quality and safety of fish products derived from fishing, collecting vessel, landing sites, auction centers, processing unit and distribution facilities. Three latest Indonesian Regulations and Decrees of Ministry of Marine Affairs and Fisheries are effectively implemented from 1st August 2007. These

Regulations and Decrees focused on (1) The Control of Quality Assurance and Food Safety System of Fisheries Products; (2) Monitoring of Drug Residues, Chemicals, Biological Substances and Contaminants in Aquaculture; and (3) Requirements for Quality Assurance and Safety of Fishery Products During Production, Processing and Distribution. In addition, one guideline on the Inspection and Monitoring Program for Fisheries Products is described in the Decree of Director General of Fisheries Products Processing and Marketing.

These Regulations and Decrees are parallel with the activities under the Japanese Trust Fund II Project such as regional surveys on chemical contaminants. These activities are useful and valuable to implement in Indonesia in order to support our national residues monitoring program to produce good and safe Indonesian fish products.

In order to ensure that Indonesian fish and fish products have a low chemical contamination or low level of histamine content, it is mandatory to survey and monitor the fish and fish product. If the concentration of histamine obtained is higher than the maximum residue limit (MRL) the corrective actions would be taken according to the procedure stipulated in the regulation.

## 2. Objectives and Goals

Through the participation of the research and analysis of histamine in fish and fish products in Indonesia, we expect to be able to:

- Obtain an understanding on the level of histamine content in fish and fish products in Indonesia;
- Set up and implement the monitoring program on histamine in fish and fish products;
- Strengthen the fish inspection and quality control system, including the improvement of laboratory personal skill in conducting fish inspection and quality analysis;
- Improve and facilitate the analysis of chemical

contamination in fish and fish products in Provincial Laboratories for Fish Inspection and Quality Control; and

- Supply fish and fish products that comply with international market standard and food safety requirements.

### 3. Survey Methodologies

#### a. Sampling Method, Location, Species, Number of Samples and Sampling Size

Sampling method was conducted according to the National Sampling Plan and the monitoring program of each Provincial Laboratory for Fish Inspection and Quality Control (PL-FIQC). During 2005 to 2008, sampling of raw material for histamine analysis was carried out at 6 provinces which are representatives for producing fish and fish products, namely:

- (1) Jakarta
- (2) East Java
- (3) South Sulawesi
- (4) North Sulawesi
- (5) Bali, and
- (6) Maluku

All the raw material collected as samples were marine fish products especially scombroidae and deep sea fish species such as tuna, skipjack tuna, swordfish, marlin, etc. In most cases, raw materials were taken from the fish landing places and some fish processing plants. Frozen fish collected from some processing plants were usually analyzed directly for histamine. The period of sampling was quarterly in 2005 and 2006; every two months in 2007 and 2008.

After sampling, the samples were handled according to their characteristic. For fresh samples, they were handled carefully, quickly and maintained in a cool condition so that the sample characteristics would not change. The temperatures were also recorded. Samples were analyzed as soon as possible. If the analysis should be delayed, samples were kept at  $-18^{\circ}\text{C}$ . For samples from locations that are far away, pre-preparation of samples was done in the mini laboratory inside the vehicle for sampling. Pre-extraction with methanol was done prior to laboratory testing. 10 g of sample was weighed into a beaker and 50 ml of methanol was added. The sample mixture was blended and histamine was extracted upon arrival at the laboratory. Nine replicates ( $n=9$ ) were used for analysis.

#### b. Method of Analysis

The Spectro-fluorometer method was used for analysing histamine.

#### c. Limit of Detection and Limit of Quantification

Limit of Detection for Histamine : 2.50 ppm

#### d. National Regulatory Limits

National Standard Limit of histamine for fish and fish products is 50 ppm.

### 4. Results and Discussion

#### a. Participation of Inter-laboratory Proficiency Testing and Results

Inter-laboratory proficiency testing are usually conducted routinely by the NCQC to all the Provincial Laboratory for Fish Inspection and Quality Control (PL-FIQC) in Indonesia. The focus for proficiency testing is usually microbiology (*E-coli*, *Salmonella*, etc.) and chemical testing such as heavy metals. Indonesia did not participate in any inter-laboratory testing for histamine.

#### b. Survey Results and Discussion

Survey on histamine in fish and fish products in 2005 and 2006 was focused on the 5 locations namely Jakarta, East Java, Bali, South Sulawesi and North Sulawesi. The sampled species were tuna, marlin, swordfish, red snapper, canned tuna, etc., and the total samples collected were 104 samples. The sampling was conducted on July, October and December 2005. No sample out of the 104 samples analysed was found to contain histamine higher than the Indonesia National Standard of 50 ppm. This means that all sample analyzed complied with Indonesian and international requirements. There is only 1 exception in 2006 for Marlin. The low histamine content especially for 5 samples taken from North Sulawesi might be due to the short landing time or one day fishing from the small fishing vessel for tuna catch.

In 2007, the survey of histamine also focused on the 5 locations namely Jakarta, Bali, South Sulawesi, North Sulawesi and Maluku Provinces and the fish species sampled were tuna, marlin, swordfish, skipjack tuna, red snapper, canned tuna, etc., and the total of sample was 54 samples. Maluku Province was chosen to replace East Java as it produces mostly scombroidae fish species. The results of

histamine content analyzed in 2007 shows that no sample was found to contain histamine higher than the Indonesia National Standard of 50 ppm. This meant that all sample analyzed complied with the Indonesian and international requirements. Some samples taken from Jakarta, Bali, South Sulawesi and North Sulawesi showed low content of histamine as the samples collected were of sashimi grade and is usually exported to Japan.

In 2008, the survey of histamine focused on 4 locations which were Jakarta, Bali, South Sulawesi (Makassar) and North Sulawesi (Bitung) with 2 sampling conducted on February and April 2008 and the raw material was mainly tuna. The results of all samples analyzed shows that the histamine content were lower than the national and international standards.

Table 1. Data Monitoring Histamine Conducted in Jakarta, East Java, Bali, South Sulawesi and North Sulawesi in 2005.

No.	Location	Time of Sampling	Species / Products	Temperature Records During Sampling (°C)	Histamine (ppm)
1.	Jakarta	July 2005	1. Tuna	4.8	30.20
			2. Marlin	5.0	22.00
			3. Canned tuna	Not recorded	18.10
		October 2005	1. Tuna	4.4	24.10
			2. Marlin	4.8	34.40
			3. Swordfish	5.0	8.80
		December 2005	1. Tuna	4.4	16.40
			2. Marlin	5.0	14.20
			3. Canned tuna	Not recorded	18.20
			4. Baby tuna	4.0	22.0
2.	East Java	July 2005	1. Tuna	4.8	38.20
			2. Marlin	5.4	40.20
			3. Canned tuna	Not recorded	8.40
		October 2005	1. Tuna	4.4	22.20
			2. Marlin	4.8	18.10
			3. Swordfish	5.2	20.00
		December 2005	1. Tuna	4.0	16.0
			2. Marlin	5.4	32.40
			3. Baby tuna	4.2	18.40
		3.	Bali	July 2005	1. Tuna
2. Marlin	5.0				20.20
3. Black marlin	4.4				12.30
October 2005	1. Tuna			4.4	20.80
	2. Marlin			4.8	18.30
	3. Swordfish			4.4	12.00
December 2005	1. Tuna			4.4	20.00
	2. Marlin			5.0	18.40
	3. Baby tuna			4.8	28.10

4.	South Sulawesi	July 2005	1. Tuna	5.0	24.80
			2. Marlin	5.2	20.20
			3. Black marlin	4.0	14.00
		October 2005	1. Tuna	4.8	30.20
			2. Marlin	5.0	28.10
			3. Swordfish	5.2	32.30
		December 2005	1. Tuna	4.4	22.00
			2. Marlin	4.4	18.10
			3. Baby tuna	4.8	28.20
5.	North Sulawesi	July 2005	1. Tuna	4.0	10.80
			2. Canned tuna	Not recorded	10.10
		October 2005	1. Tuna	4.2	16.40
			2. Marlin	4.4	12.30
			3. Red snapper	5.6	8.10
		December 2005	1. Tuna	4.4	20.30
			2. Canned tuna	Not recorded	16.10
			3. Baby tuna	4.0	12.10

Table 2. Data Monitoring Histamine Conducted in Jakarta, Bali, South Sulawesi and North Sulawesi in 2006.

No.	Location	Time of Sampling	Species / Products	Temperature Records During Sampling (°C)	Histamine (ppm)
1	Jakarta	March 2006	1. Tuna	5.0	28.40
			2. Marlin	5.0	20.60
			3. Swordfish	5.0	22.20
			4. Red Snapper	4.0	11.40
		June 2006	1. Tuna	5.0	40.60
			2. Marlin	5.4	44.30
			3. Swordfish	4.4	18.70
			4. Red Snapper	4.4	10.26
		September 2006	1. Tuna	4.8	34.80
			2. Grouper	4.4	18.40
			3. Swordfish	4.4	24.70
			4. Marlin	5.6	50.20
2.	Bali	March 2006	1. Bluefin tuna	4.4	19.40
			2. Swordfish	4.0	11.50
			3. Marlin	4.4	21.60
			4. Butterfish	4.0	6.70
		June 2006	1. Yellowfin tuna	4.4	24.20
			2. Swordfish	4.0	8.60
			3. Striped marlin	4.0	18.90
			4. Butterfish	4.0	7.20
		September 2006	1. Bluefin tuna	4.4	11.30
			2. Swordfish	4.0	5.40
			3. Black marlin	4.0	12.90
			4. Butterfish	4.0	10.20

3.	South Sulawesi	March 2006	1. Tuna	4.4	16.30
			2. Skipjack tuna	4.0	9.20
			3. Grouper	4.0	6.20
			4. Lether jacket	4.2	5.70
		June 2006	1. Tuna	4.4	14.90
			2. Grouper	4.4	8.60
			3. Lether jacket	4.4	6.40
			4. Baramundi	4.0	4.80
		September 2006	1. Skipjack tuna	4.4	10.60
			2. Tuna	4.4	14.20
			3. Snapper	4.0	6.30
			4. Grouper	4.0	6.80
4	North Sulawesi	March 2006	1. Bluefin tuna	4.4	10.40
			2. Canned tuna	Not recorded	7.60
			3. Marlin	4.8	12.80
			4. Skipjack tuna	4.0	10.80
		June 2006	1. Skipjack tuna	4.8	12.20
			2. Yellowfin tuna	4.4	10.20
			3. Canned tuna	Not recorded	9.40
			4. Bluefin tuna	4.4	9.80
		September 2006	1. Skipjack tuna	4.0	8.90
			2. Canned tuna	Not recorded	10.30
			3. Frozen tuna	4.4	14.20
			4. Marlin	5.0	17.10

Table 3. Data Monitoring Histamine Conducted in Jakarta, East Java, Bali, South Sulawesi, North Sulawesi and Maluku in 2007.

No.	Location	Time of Sampling	Species / Products	Temperature Records During Sampling (°C)	Histamine (ppm)
1.	Jakarta	April 2007	1. Blue-fin tuna	3.8	3.85
			2. Marlin	4.4	18.68
			3. Oil-fish	4.4	2.79
			4. Black marlin	4.4	8.86
		June 2007	1. Bluefin tuna	4.0	14.22
			2. Marlin	4.8	18.60
			3. Swordfish	4.8	6.40
			4. Spanish mackerel	4.4	4.21
		August 2007	1. Bluefin tuna	4.0	3.25
			2. Marlin	4.4	3.68
			3. Spanish mackerel	4.4	2.88
			4. Baby tuna	4.4	12.00

2.	Bali	April 2007	1. Yellowfin tuna	4.0	5.60
			2. Marlin	4.8	13.30
			3. Bluefin tuna	4.0	8.10
		June 2007	1. Yellowfin tuna	4.0	21.60
			2. Marlin	4.0	16.10
			3. Swordfish	4.8	22.00
			4. Bluefin tuna	4.4	15.60
		August 2007	1. Bluefin tuna	4.4	12.90
			2. Marlin	4.4	12.40
			3. Striped marlin	6.0	47.70
			4. Yellowfin tuna	4.4	11.40
		3.	South Sulawesi	April 2007	1. Baramundi
2. Bluefin tuna	5.0				20.20
3. Marlin	4.0				14.60
June 2007	1. Red snapper			4.4	6.10
	2. Swordfish			4.8	18.60
	3. Marlin			4.8	26.0
August 2007	1. Bluefin tuna			4.4	12.0
	2. Marlin			4.8	16.40
	3. Baby tuna			4.8	18.10
4.	North Sulawesi	April 2007	1. Bluefin tuna	4.0	3.52
			2. Marlin	5.0	18.69
			3. Yellowfin tuna	4.4	12.67
			4. Black marlin	4.4	14.0
			5. Skipjack tuna	4.0	3.77
		June 2007	1. Yellowfin tuna	3.8	6.11
			2. Marlin	4.8	14.69
			3. Canned tuna	Not recorded	8.73
			4. Skipjack tuna	4.0	5.09
			5. Yellowfin tuna	4.0	6.55
		August 2007	1. Yellowfin tuna	4.4	12.96
			2. Marlin	4.8	9.52
			3. Canned tuna	Not recorded	2.48
			4. Skipjack tuna	4.8	8.84
		5.	Maluku	April-May 2007	1. Yellowfin tuna
2. Skipjack tuna	4.0				6.10
June-July 2007	1. Yellowfin tuna			4.4	16.40
	2. Marlin			5.0	22.30
	3. Skipjack tuna			4.4	8.10
August-September 2007	1. Yellowfin tuna			4.8	8.30
	2. Canned tuna			Not recorded	12.20
3. Skipjack tuna	4.4	10.10			

Table 4. Data Monitoring Histamine Conducted in Jakarta, Bali, South Sulawesi and North Sulawesi in 2008.

No.	Location	Time of Sampling	Species / Products	Temperature Records During Sampling (°C)	Histamine (ppm)
1.	Jakarta	February 2008	1. Loin tuna *	4.0	10.00
			2. Black marlin*	4.0	20.00
			3. Fresh tuna	4.0	14.00
		April 2008	1. Loin tuna *	4.4	12.00
			2. Marlin*	4.4	18.00
			3. Swordfish*	4.4	6.00
2.	Bali	February 2008	1. Skipjack tuna	4.4	14.20
			2. Fresh tuna	4.4	12.80
			3. Loin tuna*	4.4	11.05
		April 2008	1. Frozen <i>YF</i> tuna*	4.4	16.55
			2. Swordfish*	4.4	14.00
			3. Fresh tuna	4.4	10.40
3.	South Sulawesi	February 2008	1. Black marlin	4.4	18.00
			2. Swordfish	5.6	24.00
		April 2008	1. Frozen tuna*	4.8	20.00
			2. Black marlin	4.0	18.00
4.	North Sulawesi	February 2008	1. Fresh tuna	4.2	6.95
			2. Fresh loin tuna*	4.4	5.50
			3. Black marlin	4.0	16.00
		April 2008	1. Canned tuna*	Not recorded	16.85
			2. Fresh loin tuna*	4.4	14.00
			3. Fresh tuna	4.0	8.00

**Note**

Method of Analysis: Spectrofluorometric

Limit of Detection (LOD) of Histamine: 2.50 ppm

\* Sample taken from fish processing plant

### c. Corrective Actions

The corrective action will be taken when the results of monitoring does not comply with the standard or higher than the standard. The corrective action process for non-compliant results is as follows:

- Carry out the investigation such as traceability to the fishing ground areas.
- Verification of sampling and analysis methods.
- Perform repeat sampling.
- Exclusion of products with higher than the maximum residue limit allowed from establishment or continue processing as products not for human consumption.
- Intensively control the histamine content in fish and fish products during processing or during fishing.

Moreover, in order to ensure the safety of fish and fish products, Indonesia Government undertakes continuous actions such as: (1) Surveillance of stakeholders to ensure their compliance with the rules and regulations in the standards/procedures and (2) Obtain data and information periodically on the level of histamine in fish and fish products.

## 5. Problems and Challenges Encountered

Problems faced during the histamine monitoring and surveys are as follow:

- 1) Analysts are not properly qualified to perform histamine analysis using the High Performance Liquid Chromatography (HPLC), and they are still using the Spectrofluorometer.
- 2) Lack of networking system to harmonize the standard and methods of analysis for histamine among ASEAN countries.
- 3) Lack of awareness of quality and safety issues amongst fishermen and fish handlers who subject temperature abuse to fish and fish products during landing and in fishing port and results in the increase of histamine content.
- 4) Lack of suitable infrastructure for preservation, storage and distribution system which caused the increase in histamine content in fish and fish products.
- 5) Stringent requirements set by importing countries for monitoring program such as histamine in fish and fish products.

## 6. Recommendations and Suggestions for Future Follow up in Action

- 1) Need training program for methods validation and verification especially in the determination of the limit of detection and minimum residue performance limit for histamine.
- 2) Need training to improve the methods of analysis for histamine.
- 3) Need to establish networking system to develop the method of analysis for histamine among ASEAN countries.
- 4) Need to establish harmonizing standard especially for maximum level of histamine in order to fulfill the requirements of importing countries such as EU.
- 5) Need to improve the accuracy of testing results by participating in proficiency testing program especially for histamine among ASEAN countries.