

## HISTAMINES IN FISH

In three studies on histamines in fish conducted on behalf of the Department of Human Services (DHS), as many as 51 percent of seafood products tested exceeded the permitted level for histamines. Histamines in fish can cause allergic reactions in people ranging from mild skin discomfort to nausea, vomiting and diarrhoea.

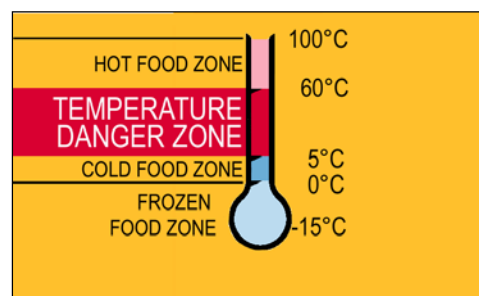
The level of histamine in fish, canned, frozen or fresh is affected by the presence of certain proteins which are converted to allergenic products by bacteria present. Correct temperature control can limit the production of histamines.

Research by the DHS into histamines in fish began in 1995, with a project to verify testing methods. This was followed by a survey in July 1996, which targeted canned fish products.

The number of products over the limit, in canned fish products in particular, prompted the DHS to conduct further research during 2000 into the affect of storage time and temperature on histamine production to determine whether existing food handling practices were adequate. The 2000 study concluded that if appropriate temperature control practices were followed, production of histamine was limited.

A summary of each of the studies can be found below.

### BACKGROUND



Almost all foods has bacteria on it right from the start. This is because most food comes from the natural environment where bacteria are always present. When meat is stored in the *Temperature Danger Zone* of between 5°C and 60°C, even for short periods, the number of bacteria present can multiply very quickly.

Fish are a particular concern when it comes to maintaining temperatures of less than 5°C. This is because if the fish contain an amino acid called *Histidine*, the bacteria can turn this into *Histamine* which is a physiological amine responsible for many allergic reactions. Once histamine is formed it is not destroyed by freezing, cooking, smoking, curing or canning This is the same histamine that causes problems for some people when high levels are produced in cheese and red wine..

The Food Standards Code was amended to increase the permitted level for histamines from 100mg/kg to 200mg/kg as a result of other research that indicated the threshold for allergic reaction to histamines was higher in the general population than earlier believed.

Fish can also contain other amino acids: *Putrescine*, *Cadaverine*, and *Spermine* and bacteria can act on these to produce other biogenic amines. The roles of these amines in allergic reactions is less clear.

Eating fish with high levels of histamine can result in histamine fish poisoning (HFP). HFP was previously also called Scombroid Fish Poisoning.

The symptoms of HFP can be very similar to a sever allergic reaction, can happen within minutes to hours after ingestion of the toxic fish and may include:

- A burning/tingling sensation in/around the mouth,
- Rash and/or swelling over the chest and /or neck,
- Lowering of blood pressure,
- Headache,
- Itchy skin,
- Nausea,
- Vomiting, and

- Diarrhoea.

Most of these symptoms will stop after a few hours.

Tuna and mackerel, members of the family *Scombroidea* tend to have high levels of histidine and are therefore more likely to be implicated in allergic reactions. However, many non-scombroid species, for example sardines, blue fish, mahi mahi have caused HFP, so the term Scombroid Fish Poisoning is a misnomer.

## DHS HISTAMINE STUDIES

### Study 1

In 1995, Food Safety Victoria (FSV) identified fish poisoning cases where other toxins (ciguatera, paralytic shellfish, domoic acid) were excluded and histamine, in connection with other spoilage biogenic amines, was suspected. FSV commissioned the State Chemistry Laboratory to validate a method for total biogenic amines in food and to apply it to a range of fish products.

Of 55 samples purchased from supermarkets, 8 (15%) exceeded the then-regulated level (100mg/kg) of histamine (See Table 1).

Food Amine mg/kg	Chinese Sausage	Crab Mackerel Salmon Tuna, Dace	Pilchards Sardines Anchovies	Dried Mackerel	Squid Prawns	Fish Paste	Catfish Snake Fish Tench Fish
Histamine	2	10	30	35	40	150	250
Putrescine	10	2	25	25	540	300	175
Cadaverine	5	20	50	65	540	200	100

Table 1: Average levels of Biogenic Amines in local and imported food products, milligram per kilogram

Histamine eaten in spoiled fish appears to be more toxic than an equal amount of histamine taken orally in a solution. It is thought that the other biogenic amines (Putrescine, Cadaverine etc.) produced in fish may potentiate the histamine action.

### Study 2

In July 1996, a survey targeted at canned fish products showed 51 percent (19/37) of samples failing the then regulated histamine level of a maximum of 100mg/kg.

The main offenders in this study were:

Product type	Country of Origin (number)	
Pickled Fish	Vietnam (5)	Thailand (3)
Pickled Prawn/Shrimp	Vietnam (2)	Thailand (2)
Fish Sauce	Vietnam (1)	Thailand (1)

Table 2: Canned and bottled product failing the histamine standard of 100mg/kg showing country of origin and number of samples failed

Over the next few years, sporadic cases of alleged fish poisoning occurred in Victoria but in most cases, samples of the fish or specimens from the person(s) affected were not available for analysis. Several cases were believed to be ciguatera poisoning associated with large tropical fish (coral trout) imported from North Queensland for special celebrations (Chinese New Year, for example).

At the same time of this study, the Food Standards Code was reviewed and the maximum histamine level was increased from 100mg/kg to 200mg/kg. The Australian Quarantine

Inspection Services (AQIS) reported that up to 16 percent of imported fish products tested through their Imported Foods Inspection Program failed the new histamine standard.

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### Study 3

FSV commissioned a study on the effects of storage time and temperature on the levels of biogenic amines

Duplicate analysis of Yellow Fin Tuna showed:

Storage Type	Temperature	Amine Production
Ambient	17°C	Histamine & Cadaverine are produced as the fish deteriorated. Histamine ranged from nil originally to nearly 200 after 48 hours to ten times the regulated value after 96 hours.
Refrigeration	4°C	Histamine and Cadaverine still formed, but Histamine only approached the regulated level after 13-15 days.
Freezing	0 C	Neither Histamine and Cadaverine produced until day 4 and never approached the regulated level

*Table 3: Showing the effect of storage temperatures on Amine production*

### Conclusions

Although our tests indicate that many fish products exceed the maximum levels of histamine, this has not shown up in reports of food poisoning incidents in the past ten years. This may be because very few incidents have included an analysis of the suspected product or specimens.

Where contaminated fish is shown to contain abnormally high levels of histamine from the market place when human illness occurs, the fish should be removed from sale.

More research is needed to determine the threshold of toxicity for histamine and the role that other biogenic amines play. This research can be assisted by investigating officers securing samples and specimens during incidents for analysis for histamine and other biogenic amine levels.

As well, there needs to be a mechanism to trace suspect fish to its point of origin. Tracing fish in commercial outlets is difficult, due to a lack of a 'ticketing' system, especially at the wholesale level. Future Quality Control programs proposed for the fish processing industry should reduce problems in this area.

The key to controlling histamine production is rapid cooling of the fish once caught and maintaining a temperature of less than 5°C until it is cooked. Best practice is to prevent amine production in the first place. Once histamine is formed it is not destroyed by freezing, cooking, smoking, curing or canning.

FSV intends to conduct further surveys on histamines to assess compliance with the Food Standards Code.

### For More Information

A brochure detailing Histamine Fish Poisoning and other Naturally Occurring Seafood Toxins can be accessed at the Food Safety Victoria website [www.foodsafety.vic.gov.au](http://www.foodsafety.vic.gov.au)

Seafood Services Victoria has information of correct fish handling procedures and can be contacted on 03 9853 5753

For advice on poisoning call the Poisons Information Service on 13 1126.