

Histamine poisoning: keep your fish cold!

Histamine poisoning due to fish consumption is common, but can be prevented by maintaining the cold chain at all stages, from when the fish is caught and prepared by professionals through to its storage in the consumer's home. The study of poisoning cases recorded by French poison control centres showed that cases mainly occurred as a result of eating fish purchased in shops and, to a lesser extent, fish consumed in restaurants. In all these cases there is reason to suspect a problem with storage. ANSES reiterates the food hygiene rules to be followed in order to prevent these potentially serious poisonings.



Histamine poisoning is one of the main causes of foodborne illness related to fish consumption.

Why can you get histamine poisoning from eating fish?

Histamine is naturally synthesised in humans and animals. It is found in all fish normally at low levels. It is formed from the breakdown of the amino acid histidine by bacteria present on the skin or in the viscera of fish and in the marine environment, which multiply at room temperature. Histamine is not degraded by cooking or freezing.

The risk of a high histamine concentration depends firstly on the risk of bacterial contamination when the fish is caught and then prepared (evisceration, filleting, etc.), and secondly on the risk of bacterial proliferation in its flesh at every step of its storage, before, during or after sale.

Some species of fish are richer in histidine than others, which can lead to higher histamine production. These are mainly Scombridae such as tuna, mackerel, kingfish and bonito (hence the frequently used name scombroid fish poisoning), or other species such as sardines, herring, anchovies, jacks, swordfish or dolphinfish.

Checks to prevent poisoning

Producers and distributors have defined and implemented guides to good hygiene practices (GGHPs) and are also subject to numerous annual hygiene and cold-chain checks by the Directorate General for Food (DGAL). Fishery products with histamine levels above the regulatory threshold¹ are not sold or are withdrawn from the market if they were already on sale.

The DGAL asked ANSES for an opinion on the sampling strategy for fish to be monitored and assayed.

In this context, ANSES and the poison control centres (PCCs) analysed cases of histamine poisoning after fish consumption reported to the PCCs, paying particular attention to the species of fish consumed, and how it was obtained, stored and prepared.

Amended Regulation (EC) No 2073/2005 laying down food safety criteria for histamine in different fishery products according to their manufacturing process.

Cases of both individual and collective food poisoning

All cases of symptomatic food poisoning from fish recorded by the PCCs from 2012 to 2021 were reviewed by an expert toxicologist from the PCCs to select those consistent with histamine poisoning, based on the symptoms and the species of fish consumed.

Cases were either individual (a single symptomatic person) or collective (at least two symptomatic persons sharing the same fish meal).

This review identified a total of 543 patients who had eaten 173 fish meals causing histamine poisoning in France (both metropolitan France and the overseas territories). Poisoning was individual for 53% of the meals (91 meals) and collective for 47% (82 meals), with the number of diners per meal in the latter ranging from two to 24. In one exceptional case, a meal resulted in the poisoning of 200 consumers.

Poisoning was more common among adults (57% of those contaminated) than children (43%). Two mass poisonings occurred in school canteens, affecting 200 children aged 3 to 5 years in the first case (mentioned above) and six children aged 8 to 10 years in the second. If this foodborne illness outbreak of 200 cases is excluded, the proportion of children involved falls to 10%.

The average number of fish meals causing poisoning over the study period was 17 per year. However, the annual number of meals observed varied from six in 2019 to 45 in 2021, with no identified cause that would explain this change (Figure 1).

1. Amended Regulation (EC) No 2073/2005 laying down food safety criteria for histamine in different fishery products according to their manufacturing process.

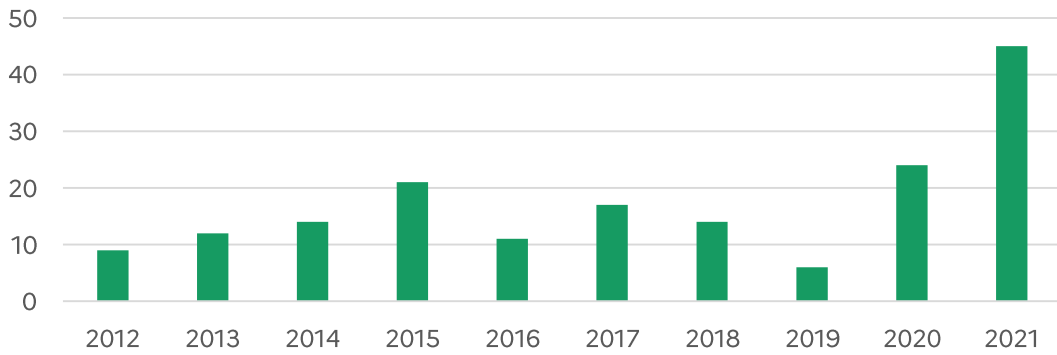


Figure 1: Annual distribution of fish meals causing histamine poisoning recorded by PCCs from 01/01/2012 to 31/12/2021 (N=173). Source: SICAP.

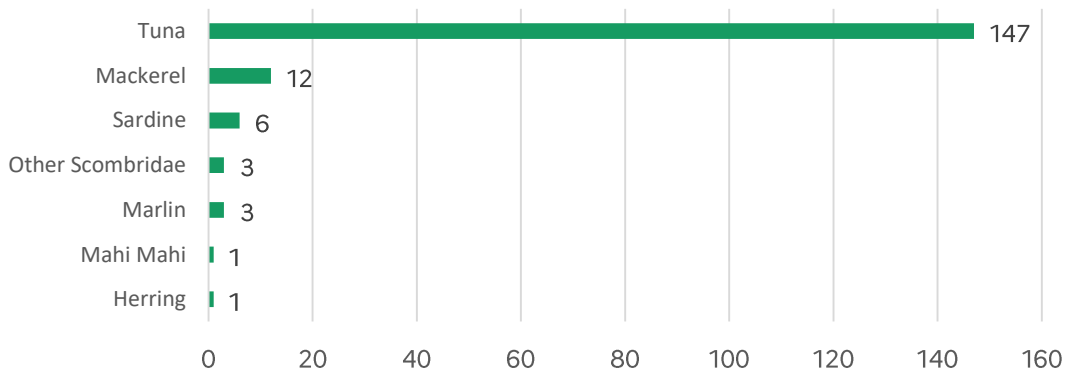


Figure 2: Distribution of fish species causing histamine poisoning recorded by PCCs from 01/01/2012 to 31/12/2021 (N=173). Source: SICAP.

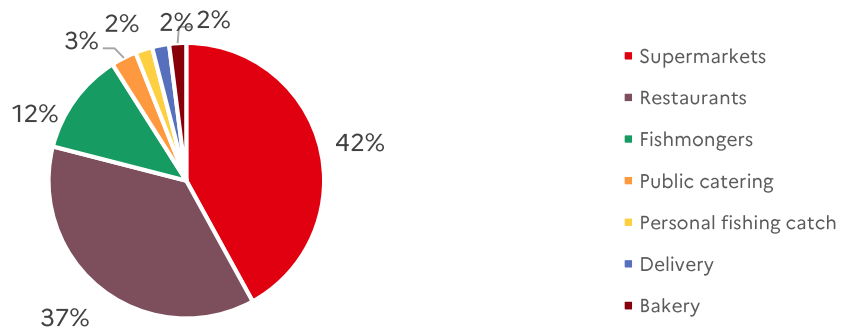


Figure 3: Origin of fish meals causing individual or collective histamine poisonings recorded by the PCCs from 01/01/2012 to 31/12/2021 (N=173). Source: SICAP.

These poisonings were observed throughout the year, but were characterised by a marked seasonality, with more cases in the warmer months. They were most frequent from July to October (36% of meals), then from April to June (29% of meals), as the higher temperatures at these times favour histamine formation if the cold chain is broken.

Poisoning was observed in all regions, and especially in Île-de-France, Provence-Alpes-Côte d'Azur and Nouvelle-Aquitaine, which together accounted for more than half (55%) of the fish meals causing histamine poisoning (these three regions represent 34% of the French population).

Misleading symptoms resembling an allergy

Histamine is known to play an important physiological role in inflammatory and allergic phenomena. Although it is histamine poisoning and not an allergic reaction (patients will be able to eat properly stored tuna on another occasion without becoming ill), the symptoms mimic an allergy in every respect. The 543 patients in the study reported the following signs: urticaria (79% of patients), transient skin redness (71%), headache (50%), itching (37%), tachycardia (33%), nausea (20%) and vomiting (9%). The first symptoms described appeared on average 35 minutes after the meal. Four patients experienced a sudden drop in blood pressure, a marker of clinical severity. A total of 25 patients were hospitalised (4.6%), two of whom in intensive care. All of them recovered.

Poisoning mainly but not exclusively due to Scombridae (tuna family)

While, as expected, the vast majority of poisoning cases were due to consumption of tuna (85% of meals) or other Scombridae (mackerel, 7%, others 3%), other fish were also involved, such as sardines, which accounted for 3% of the incriminated meals.

Fish mostly consumed at home

Of the 173 meals that caused histamine poisoning, the fish had most often been purchased from a retailer: a supermarket (42%) or fishmonger (12%) (Figure 3). Several case files indicated that the consumer had not maintained the cold chain to store the fish (tuna slices left in the sun on the parcel shelf of the car, etc.). Fish eaten in a restaurant accounted for 37% of the meals that caused poisoning.

Fish mostly bought fresh, prepared in a variety of ways

Two thirds (65%) of the fish had been bought or eaten fresh, of which 53% was consumed in restaurants and 41% after purchase in supermarkets or fishmongers. However, poisoning can occur with any type of preservation method, including canned fish, which accounted for 10% of the meals in question. Thirteen per cent of the fish was purchased vacuum-packed, and the remaining 12% was frozen.

More than half (55%) of the fish was grilled before consumption, confirming that histamine is not destroyed by cooking. While raw fish (sushi or tartare) accounted for 15% of meals, all types of preparation were observed: in sauce/baked, fried, steamed, in salads or in sandwiches.

Although the number of cases is probably underestimated, as people prefer to call a doctor for a physical consultation rather than a PCC in the event of a reaction resembling an allergy, this study shows that histamine poisoning following fish consumption is not uncommon, although it is most often avoidable, and provides an opportunity to remind consumers of the risks of serious poisoning if hygiene rules are not followed.

To avoid bacterial proliferation that could promote the formation of histamine in fish purchased from a retail outlet or caught, it is essential to maintain the cold chain before consumption, by:

- refrigerating or freezing fish as soon as possible;
- not leaving fish at room temperature or in the sun;
- if frozen, thawing the fish quickly and then eating it immediately;
- never refreezing fish that has been thawed.

When histamine has formed, it cannot then be destroyed either by cooking, canning or freezing.

**Sandra SINNO-TELLIER (ANSES)
and Luc DE HARO (Marseille Poison Control Centre)**

In the event of a life-threatening emergency (swelling of the face or throat, difficulty breathing, loss of consciousness, etc.) immediately call **15 (in France) or 112, or 114 for the deaf and hard of hearing.**

In the event of poisoning, call a PCC or see a doctor.

Keep any leftovers from the fish meal for analysis and screening for contamination by histamine or micro-organisms if necessary.