



Scombroid Fish Poisoning Associated with Tuna Steaks --- Louisiana and Tennessee, 2006

Scombroid fish poisoning is an acute illness that occurs after eating fish containing high levels of histamine or other biogenic amines. Symptoms typically include facial flushing, sweating, rash, a burning or peppery taste in the mouth, diarrhea, and abdominal cramps and usually resolve within several hours without medical intervention. More severe symptoms (e.g., respiratory distress, swelling of the tongue and throat, and blurred vision) can occur and require medical treatment with antihistamines. In late 2006, two outbreaks of scombroid fish poisoning occurred, one in Louisiana and one in Tennessee. To determine the source of the outbreaks and to implement control measures, CDC and the state health departments in Louisiana and Tennessee conducted epidemiologic investigations, and the Food and Drug Administration (FDA) conducted traceback investigations of the product. This report describes the results of those investigations, which indicated that the outbreaks in Louisiana and Tennessee were associated with tuna steaks from Indonesia and Vietnam, respectively. The majority of seafood eaten in the United States is imported. FDA programs to identify and prevent seafood hazards such as scombroid fish poisoning have made substantial progress but are able to inspect only a small proportion of seafood entering the United States. The only effective method for prevention of scombroid fish poisoning is consistent temperature control of fish at $\leq 40^{\circ}\text{F}$ ($\leq 4.4^{\circ}\text{C}$) at all times between catching and consumption.

Louisiana. On December 14, 2006, six employees of an oil refinery ate at the company cafeteria and became ill with symptoms resembling an allergic reaction within 2 hours of eating tuna steaks. The refinery nurse notified the Louisiana Office of Public Health, and an epidemiologic investigation was initiated to identify the source of the outbreak and implement control measures. Four refinery employees went to the infirmary with facial flushing and pruritic rashes on the face, neck, and trunk and reported heart palpitations and diarrhea after eating tuna steak in the cafeteria. Median time from eating to onset of symptoms was 1 hour (range: 15 minutes--2 hours). On the basis of clinical symptoms and seafood exposure, scombroid fish poisoning was suspected, and the remaining tuna steaks were immediately removed from the cafeteria line. A facilitywide announcement resulted in identification of two additional cases. Five of the patients were treated with diphenhydramine and loperamide at the refinery infirmary, and one patient was treated with diphenhydramine at a local hospital emergency department.

The epidemiologic investigation indicated that six (26%) of 23 persons served tuna steaks became ill. Symptoms included diarrhea (six persons), facial flushing (five), rapid heartbeat (five), headache (four), rash (three), and shortness of breath (three). Other symptoms included nausea, vomiting, sweating, burning throat, pharyngeal constriction, peppery taste, and abdominal cramps. All symptoms resolved within 24 hours of onset.

Parish sanitarians inspected the cafeteria and found no critical violations. Laboratory testing of tuna steaks from the cafeteria did not detect elevated histamine levels (i.e., >50 mg/100 g) (*I*). The fish had been imported from Indonesia through Boston and shipped frozen to the Louisiana distributor. During the traceback investigation by FDA, histamine levels >50 mg/100 g were detected in tuna steaks from a shipment that a local distributor had used to supply the refinery cafeteria. Fish in the implicated shipment had not been distributed to any other facilities, and all remaining product was destroyed voluntarily. FDA's traceback investigation

of the tuna shipment did not detect any breaches in temperature control, indicating that any temperature breaches likely occurred between the time the fish was caught and the time it arrived in Boston. Additional preventive measures included a product recall by the distributor in Boston and an FDA import alert regarding the Indonesian firm that supplied the tuna steaks.

Tennessee. On November 25, 2006, five persons became ill after eating tuna steaks at one restaurant. Symptoms included skin rash (two persons), headache (two), diarrhea (three), and abdominal cramping (three), with onset occurring 35--150 minutes after tuna consumption. The index patient experienced skin rash and headache 35 minutes after eating tuna. This patient was treated at a local emergency department with antihistamine intravenously, which led to rapid resolution of symptoms. Illness in the other five persons resolved without medical intervention. The physician treating the index patient notified public health officials and the restaurant, and the restaurant immediately stopped serving the implicated fish.

County and state health officials and an FDA investigator inspected the restaurant and determined that appropriate procedures were in place for safe handling of fish. Credit card receipts and reservation histories enabled identification of 14 restaurant patrons who had ordered tuna, including the index patient. Four additional cases of scombroid poisoning were reported among these persons. During an FDA traceback investigation, none of the tuna samples from the restaurant, the restaurant distributor in Tennessee, or the wholesale distributor in Florida contained elevated histamine levels. No additional cases were identified by the managers of the 15 other Tennessee restaurants that received fish with the same lot number from the same regional distributor. The tuna implicated in this outbreak had been part of a 23,448-pound shipment from two processors in Vietnam, but the traceback investigation did not detect any breaches in temperature control for these shipments, and no alerts were issued.

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Editorial Note:

Scombroid fish poisoning occurs after eating fish with high levels of accumulated histamine or other biogenic amines. Histamine is produced and can accumulate when bacterial enzymes metabolize naturally occurring histidine in fish. This most often occurs when fish is held at ambient or high temperatures (e.g., 70°F--90°F [21.1°C--32.2°C]) for several hours but can occur at more moderate temperatures (e.g., $\geq 45^\circ\text{F}$ [$\geq 7.2^\circ\text{C}$]) (2). Rapid chilling of fish immediately after catch is the most effective measure to prevent scombroid fish poisoning. Fish from the family Scombridae (e.g., tuna and mackerel) contain high levels of free histidine in muscle tissue and are the most common sources of scombroid fish poisoning; however, other fish (e.g., mahi mahi, amberjack, bluefish, abalone, and sardines) also have been implicated.

Scombroid fish poisoning accounts for less than 0.5% of foodborne illnesses reported in the United States. During 1998--2002, a total of 118 scombroid fish poisoning outbreaks involving 463 persons were reported to CDC from state health departments (3). More cases likely are unreported because symptoms can be short in duration, mild, and difficult to distinguish from symptoms of other illnesses; additionally, reporting of individual cases is not mandatory under state or federal law. Although elevated histamine levels have been identified in the urine of patients in hospital settings (4), routine diagnosis is based on clinical signs and a history of fish consumption.

The most effective prevention for scombroid fish poisoning is proper refrigeration of fish at $\leq 40^\circ\text{F}$ ($\leq 4.4^\circ\text{C}$) at all times between catching and consumption. Sensory examination (i.e., by smell and taste) is not sufficient to detect the absence or presence of histamine; chemical testing is required (2). Unlike many bacterial pathogens, histamine is not destroyed when fish are frozen or cooked, making adherence to temperature requirements along all stages of the food supply chain essential. In these two investigations and in previously reported outbreaks (5--8), the precise breach in refrigeration along the fish supply chain was not identified. However, one investigation identified a potential risk for lengthy exposure to high temperatures when using long-line fishing methods in which caught

fish might be held in the water for up to 20 hours before being removed from the line (8).

The majority of seafood eaten in the United States is imported. In 1995, FDA established the Seafood Hazard Analysis Critical Control Point (HACCP) program to identify and prevent seafood-processing hazards that can lead to foodborne illness (9). HACCP regulations extend to importers and foreign suppliers, and FDA reports substantial progress in implementing HACCP standards for imported seafood in the United States (9). However, of approximately 8,500 firms importing seafood into the United States during 2002 and 2003, only 5%--7% were inspected by regulators, and FDA reports that firms handling fish that can cause scombroid fish poisoning have particularly low rates of compliance with HACCP regulations (9). Finally, most fishing boats, both foreign and domestic, are not expressly covered by HACCP regulations; instead, processors are expected to ensure that proper procedures for handling of catch are followed onboard fishing vessels.

These two investigations highlight the importance of timely communication among health-care providers, state and local health departments, and FDA in preventing or limiting scombroid fish poisoning outbreaks. In both of these outbreaks, health-care personnel considered scombroid fish poisoning in their initial differential diagnoses on the basis of symptoms and exposure to seafood. The restaurants in which the implicated seafood was served were notified and responded by removing the implicated seafood from the menu to prevent additional exposure and potential illness. FDA testing detected elevated histamine levels in the Louisiana outbreak and facilitated additional food-safety preventive measures in their traceback responses to both outbreaks. These investigations underscore the importance of proper temperature regulation ($\leq 40^{\circ}\text{F}$ [$\leq 4.4^{\circ}\text{C}$]) at all points of the fish supply chain to reduce the incidence of scombroid fish poisoning.

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