

*Weekly*

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## Cluster of Ciguatera Fish Poisoning --- North Carolina, 2007

Ciguatera fish poisoning (CFP) is a distinctive type of foodborne disease that results from eating predatory ocean fish contaminated with ciguatoxins. As many as 50,000 cases are reported worldwide annually, and the condition is endemic in tropical and subtropical regions of the Pacific basin, Indian Ocean, and Caribbean. In the United States, 5--70 cases per 10,000 persons are estimated to occur yearly in ciguatera-endemic states and territories (*1*). CFP can cause gastrointestinal symptoms (nausea, vomiting, abdominal cramps, or diarrhea) within a few hours of eating contaminated fish. Neurologic symptoms, with or without gastrointestinal disturbance, can include fatigue, muscle pain, itching, tingling, and (most characteristically) reversal of hot and cold sensation. This report describes a cluster of nine cases of CFP that occurred in North Carolina in June 2007. Among the nine patients, six experienced reversal of hot and cold sensations, five had neurologic symptoms only, and overall symptoms persisted for more than 6 months in three patients. Among seven patients who were sexually active, six patients also complained of painful intercourse. This report highlights the potential risks of eating contaminated ocean fish. Local and state health departments can train emergency and urgent care physicians in the recognition of CFP and make them aware that symptoms can persist for months to years.

On June 28, 2007, a woman and her husband (the index couple), both aged 31 years, were treated at a hospital emergency department for illness that developed within 24 hours after eating amberjack fish purchased from a local fish market and cooked at their home. Diagnoses of CFP were based on symptoms of mild diarrhea 4--12 hours after eating fish, followed by reversal of hot and cold sensation, abnormal skin sensations, and other neurologic symptoms within 24 hours. Both patients improved after treatment with intravenous mannitol, a long-standing treatment for CFP neurologic symptoms. Upon notification, investigators from the Food and Drug Protection Division of the North Carolina Department of Agriculture and Consumer Services contacted the fish market that sold the amberjack filets and discovered that seven of eight persons at a local dinner party also had become ill after eating amberjack from the same shipment. The one person who did not become ill was a young child who did not eat any fish.

For the subsequent investigation, a case was defined as illness with gastrointestinal or neurologic symptoms within 72 hours of eating amberjack purchased at the fish market in June 2007. The nine patients whose illnesses met the case definition included three males and six females, aged 31--44 years (median: 37 years). Patients became ill 4--48 hours (median: 12 hours) after eating the fish. Abnormal skin sensations, joint pains, or weakness, shakiness, or fatigue affected seven patients ([Table](#)). For three persons, symptoms reappeared or worsened after alcohol consumption. Six of seven sexually active

patients (two males and four females) also reported painful intercourse as a symptom. Both males described painful ejaculation with intercourse. One male stated that ejaculation was painful during the course of 1 week; the duration of the second male's genitourinary symptoms was not reported. All four females described having a burning sensation during intercourse and 15 minutes to 3 hours after intercourse. Two females reported that burning sensations associated with intercourse continued for 1 month. Severity of illness could not be related to the amount of amberjack consumed nor to the incubation period.

Symptoms (i.e., abnormal skin sensations, itching, fatigue, or altered heat-cold sensation) lasted at least 1 month in all nine patients, but cleared within 6 months in six of the patients ([Table](#)). Abnormal skin sensations persisted for 6--12 months in one of the nine patients; 1 year after onset of their CFP illnesses, two of the nine patients were still experiencing occasional symptoms of abnormal skin sensations, and one of those two was easily fatigued.

Samples of cooked amberjack were sent to the Food and Drug Administration (FDA) Gulf Coast Seafood Laboratory in Dauphin Island, Alabama, for ciguatera analysis. Acetone extracts of fish tissue were analyzed for ciguatera-related toxins using the sodium channel-specific mouse neuroblastoma assay with Caribbean ciguatoxin-1 (C-CTX-1) as a standard (2). A level of 0.6 ng C-CTX-1 equivalents per gram (0.6 ppb) of fish flesh was found in both fish samples, and C-CTX-1 was confirmed by liquid chromatography/mass spectrometry.

The first female patient had become symptomatic within 24 hours of eating the fish. She proactively collected, stored frozen, and submitted four breast milk samples for testing at the FDA laboratory because she was breastfeeding her infant and, upon researching CFP on the Internet and speaking with a Florida physician who had treated cases of CFP, had learned that breast milk might be a transmission vehicle. Against medical advice, she continued to breastfeed, but her infant, aged 8 months, exhibited no observable adverse effects. She collected one of the breast milk samples previous to eating the amberjack and the other samples at 1, 2, and 5 days after eating the fish. No activity of C-CTX-1 was reported by the FDA laboratory in any of the breast milk samples.

Traceback of the fish responsible for this cluster of CFP cases revealed that the fish was shipped to the local fish market via a seafood distributor in Atlanta, Georgia. The amberjack had been caught off the Islamorada Hump in the Florida Keys.

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## **Editorial Note:**

Ciguatoxins are lipid-soluble cyclic polyether compounds and are the most potent sodium channel toxins known (3). Carnivorous tropical and semitropical fish, such as barracuda, amberjack, red snapper, and grouper, become contaminated with ciguatoxins by feeding on plant-eating fish that have ingested *Gambierdiscus toxicus* or another member of the *Gambierdiscus* genus, a group of large dinoflagellates commonly found in coral reef waters (4). Gambiertoxins from *Gambierdiscus* spp. are converted into more potent lipid-soluble ciguatoxins. Spoilage of fish that have been caught is not a factor in toxin development, and cooking does not deactivate the toxin. Humans who eat contaminated predatory fish are exposed to variable concentrations of ciguatoxin, depending on the fish size, age, and part consumed (toxins concentrate more in the viscera, especially liver, spleen, gonads, and roe). The attack rate can be as high as 80% to 90% in persons who eat affected fish, depending on the amount of toxin in the fish.

This cluster of CFP cases was unusual because six of the seven sexually active patients, two males and four females, reported onset of painful intercourse beginning in the first few days after onset of illness.

Sexual transmission of ciguatoxin has been documented (5), and painful intercourse has been reported (6); however, painful intercourse is not commonly described as a consequence of CFP. Because all of the patients ate fish and developed other symptoms of CFP hours and days before experiencing painful intercourse, transmission through sexual intercourse was not considered likely in this cluster.

Persistence or recurrence of neurologic symptoms are hallmarks of CFP. Three of the nine patients in this cluster had recurrences of one or more symptoms for more than 6 months after their initial illness. If these patients are again exposed to fish (either ciguatoxin-contaminated or even noncontaminated fish), their symptoms likely will be more severe than those experienced with their initial episodes of CFP (3).

Variations in the geographic distribution of the various ciguatoxins might explain regional differences in symptom patterns. CFP symptoms associated with eating fish from the Pacific Ocean are primarily neurologic, and symptoms associated with eating fish from the Caribbean Sea are more commonly gastrointestinal (4). Amberjack often is linked to CFP cases in the Caribbean. Although the amberjack fish responsible for this cluster of CFP cases tested positive for C-CTX-1, it was not tested for the presence of other ciguatoxins, which also might have been present and could have altered disease presentation (7).

CFP has been associated almost exclusively with eating fish caught in tropical or semitropical waters, but increased global marketing of these species has increased the possibility that persons in temperate zones might become ill with CFP (4). Moreover, warming seawaters might expand the ranges of ciguatoxin-contaminated fish (8). In the United States, such fish have been found as far north as the coastal waters of North Carolina. Despite underreporting, CFP now is considered one of the most common illnesses related to fish consumption in the United States (9).

Any level of Caribbean ciguatoxin  $\geq 0.1$  ppb of fish tissue is thought to pose a health risk (3).\* As this illness becomes more common in nontropical areas of the world, clinicians need to be aware of its manifestations and how to manage it. Although opinions vary on the most effective course of treatment, intravenous mannitol has been a mainstay of management of neurologic symptoms for more than 20 years. Early mannitol treatment is considered more effective, but anecdotal evidence suggests that even delayed therapy benefits some patients. Amitriptyline also has been useful in relieving some of the neurologic symptoms of CFP (10). If evaluating a possible case, clinicians should consult their local poison control center for the latest treatment guidelines.

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\* FDA has proposed guidance levels of  $\geq 0.1$  ppb Caribbean ciguatoxin (C-CTX-1 equivalents) and  $\geq 0.01$  ppb Pacific ciguatoxin (P-CTX-1 equivalents) for the 4th edition of its *Fish and Fishery Products Hazards and Controls Guidance*.

## Table

TABLE. Symptoms of ciguatera poisoning among nine persons who ate amberjack, and duration of longest lasting symptoms — North Carolina, 2007

Symptom*	Reported having symptom		Duration of longest lasting symptom		
	No.	(%)	1–5 mos	6–12 mos	>12 mos
Paresthesias (abnormal skin sensations)	7	(78)	3	1	2 <sup>†</sup>
Myalgias/joint pain	7	(78)			
Weakness/shakiness/fatigue	7	(78)	1		
Painful intercourse	6	(67) <sup>‡</sup>			
Hot/cold sensation reversal	6	(67)	1		
Dizziness/light headedness/vertigo	6	(67)			
Itching	6	(67)	1		
Gastrointestinal symptoms (nausea/vomiting/diarrhea)	4	(44)			
Visual changes	3	(33)			
Rash	2	(22)			
Painful urination	1	(11)			
Fever/chills	1	(11)			

\* For three persons, symptoms reappeared or worsened after alcohol consumption.

<sup>†</sup> One person also reported being easily fatigued for >12 months.

<sup>‡</sup> Six (86%) of seven sexually active persons reported painful intercourse.

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