

# Ciguatera: A Legal and Social Overview

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## Introduction

Ciguatera is a disease produced in humans as the result of eating certain tropical marine fishes. Symptoms typically include nausea, vomiting, diarrhea, itching, and there may be a tingling or numbness in the mouth, which later spreads to the arms and legs. Often, cold objects seem hot and vice versa. Weakness and pain in the joints may be present. Initially, high blood pressure and tachycardia may be present, but in the progression of the disease, low blood pressure is common. In several cases, lowered blood pressure can require hospitalization and even produce death. Symptoms usually pass within weeks, but may linger for months.

## Folklore

Some of the folklore regarding testing for ciguatera are:

1) Ciguatoxic fish have different coloration than normal fish: a) more

yellow or brassy, b) stripes, c) darker.

2) Presence of isopod parasites indicates nonciguatoxic fish.

3) Raw flesh of ciguatoxic fish, especially the liver, tastes bitter or hot in the mouth.

4) Flies will not land on exposed flesh of ciguatoxic fish.

5) Silver or sweet potato turns black when boiled with ciguatoxic fish.

6) Ciguatoxic fish have a brassy or coppery odor.

7) Ciguatoxic fish have enlarged or bloated stomachs.

8) Ciguatoxic fish have yellow mucous or yellow inner linings of the gullet.

9) Ciguatoxic fish have a green tint to raw flesh.

10) Suspected species with roe are ciguatoxic.

11) Ants will not eat ciguatoxic fish.

12) Ciguatoxic fish have tiny black "veins" running throughout the flesh.

But experience has demonstrated that none of these can be considered reliable.

However, a test is available to the layman which is inconvenient but effective. The flesh of a suspect fish may be fed to a cat or mongoose because they respond to ciguatoxin similarly to man. The viscera of fishes (especially the liver) has higher concentrations of ciguatoxin than the flesh (Yasumoto and Scheuer, 1969). Using the liver rather than muscle tissue for ciguatera testing thus increases the sensitivity of this

crude but effective test. In the laboratory, a quantitative test for ciguatoxin is to observe the response to the injection of a serially diluted flesh extract into a mouse.

In recent years it has been strongly suggested that ciguatoxin is derived from a toxin elaborated by the dinoflagellate *Gambierdiscus toxicus* (Bagnis et al., 1980). The dinoflagellate has typically been found living among sessile macroalgae or attached to dead coral detritus or rocks in shallow water. Presumably, herbivorous fish eat the algae from the rocks and accumulate the toxin in their tissues. Carnivorous fish consuming the herbivores subsequently concentrate the toxin.

Historically, folklore belief is that ciguatera originates in areas of copper concentrations, either in natural outcrops or on the copper sheathing of sunken vessels. The copper is believed to promote the growth of a certain type of "sea moss." This concept may have some basis in fact in that a sunken vessel may provide an ecological environment which favors the colonizing sessile algae that in turn would support *G. toxicus*.

Since ciguatoxin is chemically stable and is accumulated throughout the life of the fish, higher concentrations may occur in larger fish. This has led to another piece of folklore: "An individual fish that is less than 10 percent of the maximum size attained by the species is usually safe."

Analogously, species high in the food chain or older in age may carry larger amounts of toxin. However, individual food preference and availability can greatly alter these generalities. Conceivably, a large carnivorous fish may contain no significant toxin, while a small

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*ABSTRACT—Tropical marine fish constitute a major source of nutrition to the inhabitants of many developing nations of the Pacific and Caribbean regions. The occurrence of ciguatera, as well as the continual fear that ciguatoxin may be present in certain fish, limits the use of many potentially valuable species. Additionally, U.S. law may jeopardize the commercial value of suspect fish as seafood dealers acknowledge the civil liability risk associated with the sale of ciguatoxic fish. Overall, ciguatera results in the loss of a renewable resource and threatens the industry with potential liability suits when harvesting those elements of the marine food ecosystem that are marginally risky.*

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omnivore may produce a clinical case of poisoning. Similarly, certain species, because of their dietary preferences, may pose a higher toxicity risk, while closely allied species do not.

The uneven, patchy distribution of the organism in the environment and of the toxin in the ecosystem can lead to complex considerations in predicting the toxicity of a food fish. The north side of St. Thomas, Virgin Islands, is considered to be safe from ciguatera, but the south side has a high incidence in certain species. Meanwhile, St. Croix, 40 miles to the south, is generally free of ciguatera. The dog snapper, *Lutjanus jocu*, is typically encountered on coral reefs and is regularly associated with ciguatera, while the mutton snapper, *L. analis*, seen on the same reefs and sand flats, is deemed to be safe from ciguatera. The dog snapper includes algae-eating fish in its diet, while the mutton snapper consumes sand-dwelling invertebrates.

A physical or chemical test for the presence of toxin has been unsuccessfully sought for over 20 years. The concentration of toxin present in the most toxic fish is extremely small. The challenge of detecting this molecule is made more difficult by the lack of the toxin available to researchers. Total toxin purified by all researchers to date has been less than 0.002 g. Even with this small amount of material, the ciguatoxin molecule has been found to be a long chain polyether with hydroxyl groups and a molecular weight of 1111 (Nukina et al., 1984). Investigators have been attempting the difficult task of developing a test for a still unidentified chemical that is only available in microgram amounts after laborious extractions.

Because of the continued absence of a convenient, reliable test, a careful but also fatalistic attitude is held by native seafood consumers in areas with ciguatera: One should be careful about species, size, and geographic origin of a fish, but an occasional ciguatera intoxication is accepted as inevitable.

### Legal Considerations

Since the turn of the century when pure food and drug legislation was en-

acted, such as the Federal Food, Drug, and Cosmetic Act of 1906, 34 Stat. 768, Americans have come to expect the highest standards in goods sold for human consumption.

The Uniform Commercial Code, followed by most of the states and adopted in the Virgin Islands in 1965, provides in Section 2-314 in pertinent part,

(1) . . . a warranty that the goods shall be merchantable is implied in a contract for their sale if the seller is a merchant with respect to goods of that kind. Under this section the serving for value of food or drink to be consumed either on the premises or elsewhere is a sale.

The Restatement of Torts, Second, Section 402A(2)a, also in effect in the Virgin Islands, imposes strict liability on a seller of food, even though he may have "exercised all possible care in the preparation and sale of his product." This concept developed from the old English law which imposed criminal penalties on suppliers of "corrupt" food and drink.

Within the context of strict liability, the courts have struggled with the proposition that a seller of ciguatoxic fish may be held responsible, even though he has exercised all possible care in the purchase and preparation of the fish and could not in any event have determined whether the fish was toxic.

To resolve this tension in the law between strict liability and the inability to determine toxicity despite the exercise of all possible care, the courts have focused on the consumer's knowledge of the ciguatoxic potential of the fish and have considered whether fish poisoning was within the reasonable expectation of the consumer or whether the consumer knowingly assumed the risk.

Much of the litigation related to ciguatera fish poisoning has taken place in the District Court of the Virgin Islands. No cases have been found in the jurisprudence of Puerto Rico, though attorneys licensed in that jurisdiction report that results would be similar to those in the Virgin Islands.

In a case decided in 1968, shortly after the adoption of the Uniform Commercial Code in the Islands, the plaintiff

contracted ciguatera fish poisoning when she ate a platter of fish at the defendant's restaurant. The evidence disclosed that the plaintiff, a long-time resident of St. Croix, was aware that, occasionally, persons eating fresh, local fish are poisoned, and the jury, finding that she knowingly assumed the risk, found in favor of the restaurant. Judge Maris, in sustaining the jury's verdict in *Bronson vs. Club Comanche Inc.* 6 V.I. 683, 286 F. Supp. 21 (D.C.V.I. 1968) observed that:

(T)he form of contributory negligence which consists in voluntarily and unreasonably proceeding to encounter an unknown danger, and which is commonly called assumption of risk, may be a defense in a case of strict liability such as this. If the consumer is fully aware of the danger and nevertheless proceeds voluntarily to make use of the product and is injured by it he is barred from recovery.

The defense of assumption of the risk was also cited with approval in the later case of *Hoch vs. Venture Enterprise Inc.*, 473 F. Supp. 541 (D.C.V.I. 1979), where it was determined that full factual development of all pertinent considerations would be required for the jury to resolve the issue.

Another approach was suggested by Chief Judge Christian in the case of *Battiste vs. St. Thomas Diving Club*, 1979 St. Thomas Supp. 164 (D.C.V.I. 1979). In this case the court examined two lines of authority for dealing with injuries suffered from consuming food in a restaurant, the "foreign-natural" test and the "reasonable expectations" test.

Under the "foreign-natural" test, the presence of substances that are natural to the ingredients, such as a piece of oyster shell in oyster stew, does not breach the vendor's implied warranty that the food is wholesome and fit. The court, however, preferred the "reasonable expectations" test because it permits the jury to determine whether the consumer could reasonably expect to find the toxic substance in the fish.

Of greater interest are the court's observations in *Battiste, supra* with respect to the public policy considerations.

This discussion leads the Court to the public policy arguments raised by defendant. Certainly, the continued serving of local fish by Virgin Islands restaurants is a desirable economic and gustatory goal. Unfortunately, the Court cannot ignore the competing concern that patrons of our restaurants should be afforded notice of the risks inherent in the consumption of local delicacies. The alternative is the restaurants which, however small, are in the better position to spread the risk, must bear the risk. Perhaps the most facile solution would be for menus to contain a warning about the possibility of fish poisoning. This is not a particularly appetizing suggestion, but it would solve the problem of notice at little cost to the restaurant. It can hardly be argued that such a warning would substantially injure the local fish industry since it is a fair statement that many restaurant patrons today order local fish despite their awareness of danger of fish poisoning. The warning would simply insure that all patrons have the benefit of such knowledge.

In order to insulate the valuable local fishing industry from liability, it would seem fundamentally important to ensure that a form of warning be used at every link of the commercial chain, from the fisherman to the wholesaler to the retailer and/or the restaurant. In Puerto Rico, there are prominently posted warnings at places where fish are sold pursuant to the act creating the Corporation for the Development and Administration of the Marine, Lacustrine, and Fluvial Resources, 12 L.P.R.A. Section 1351. It would also seem prudent that the insurer insist on such warnings before underwriting the business risk.

Future litigation will no doubt address the adequacy of the warning, relative to which species are suspect and the frequency of ciguatera poisoning in certain species. Nonetheless, the use of warnings would substantially reduce the likelihood of an adverse verdict and a high award of damages in favor of the unsuspecting tourist.

The major Virgin Islands insurance underwriters are not particularly concerned over the liability associated with ciguatera in restaurants. The agents usually determine that restaurants use "safe" species of fish from areas with

low ciguatera hazard. While the agents recognize the value of a warning on menus, they accede to the restaurant's concern that a warning would adversely influence sales. One insurance agent required a warning sign on the premises and a warning notice on invoices of a fish market, which has since closed. A second fish market posted a warning sign but removed it after observing adverse customer response. Insurance adjusters and underwriters typically settle ciguatera poisoning claims for small amounts rather than taking the issue before the courts.

In international trade, the Food, Drug and Cosmetic Act requires that food importers prove the safety and wholesomeness of foodstuffs entering the United States. Federal agencies have not yet addressed the question of importing potentially ciguatoxic fish. With increasing populations of Caribbean peoples residing in the United States and encouragement of trade via the Caribbean Basin Initiative, it is likely that tropical marine fishes with potential for ciguatera will be increasingly imported to the United States.

The impact of ciguatera on a small island society is significant (Olsen et al., 1984). Tacket<sup>1</sup> estimated that the annual incidence of fish poisonings reported to the emergency room in St. Thomas, Virgin Islands, was around 4.2 cases per thousand population. In a household survey, she reported a level of 7.3 per thousand, indicating that 43 percent of the cases are not reported to the emergency room. McMillan et al. (1980) found from a Virgin Islands telephone survey that 22 percent of all households surveyed experienced at least one poisoning in 5 years. Taylor (cited by Tacket<sup>1</sup>) reported that this figure was as high as 31 percent in homes where fish was eaten. Surveys of ciguatera incidence are subject to considerable bias. Many of the households in which large amounts of local fish are consumed do not have telephones, and

local people familiar with ciguatera generally do not seek professional medical assistance unless the symptoms become critical. In this regard, St. Thomas is probably typical of other islands where ciguatera is a normally accepted risk associated with the eating of local fish. Consumers who prepare fish at home attempt to reduce their risk by selecting certain species, certain sizes, and reliable vendors.

In a series of 48 interviews with fishermen, most of those interviewed in the northern U.S. Virgin Islands said they avoided fishing certain areas due to ciguatera. On St. Croix, only one fisherman restricted his fishing areas. However, fishermen always claimed they did not alter their fishing methods due to concern for ciguatera. In the northern Virgin Islands, all fishermen released certain fish that could be ciguatoxic, mainly barracuda and amberjack. Thirty-eight percent of the fishermen on St. Croix released fish at some time due to ciguatera concern.

No interviewed fisherman declined to capture certain abundant but potentially ciguatoxic fish. Thus, kingfish would be caught and marketed from an area of known ciguatera incidence. Suspect ciguatoxic yellowfin grouper are caught in large numbers when they become easily susceptible to capture in breeding aggregations. When asked if some customers avoided certain fish due to ciguatera concerns, all but one of the fishermen said yes. When asked to predict what percentage their annual income could be increased by a sure test for ciguatera, the response ranged from 0 to 75 percent.

Although the fish marketing industry is small in the Virgin Islands, ciguatera is of major concern to all who sell local fish. All businesses avoid selling certain fish (barracuda, amberjack, cubera, and large dog snappers) and buy only from reliable sources.

All vendors claimed to be willing to talk freely with customers about ciguatera. They expressed concern over legal liabilities associated with the sale of ciguatoxic fish and about loss of customers due to possible ciguatera. All businesses claimed they would change their present marketing practices if a test

<sup>1</sup>Tacket, C. Studies of epidemiological and clinical aspects of ciguatera. Unpubl. presentation, 1981 Ciguatera Conference, San Juan, P.R. Center for Disease Control, Atlanta, Ga.

for ciguatera was available. Their willingness to pay for a ciguatera test varied from \$1.00 to \$6.00 per fish. Of 12 restaurants contacted, all selected only certain species of fish from selected vendors. Two of the restaurants had a policy of preparing only imported fish that were judged to be without risk.

All of the above considerations, however, result in underutilization of a significant renewable fishery resource. The fish highly suspected for ciguatera are also of the greatest potential commercial and recreational value. Large snappers, groupers, and barracuda are eager-

ly sought by sport fishermen and divers and are highly esteemed at the dining table.

When large predatory fish high in the food chain are not harvested due to ciguatera, they in turn compete with fishermen for other harvestable fish that would otherwise be available to consumers.

A simple, inexpensive test for the presence of ciguatoxin would enhance the developing fishing industries of many tropical nations and allow use of a presently untapped renewable resource.

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