

# Fish, so foul! Foodborne illness caused by combined fish histamine and wax ester poisoning

Alexander Leask, Peter Yankos, Mark J Ferson  
South Eastern Sydney Public Health Unit

## Abstract

**Nine people who ate a fish curry from a mobile canteen experienced increased heart rate, flushed skin, headache, nausea and diarrhoea shortly afterwards. These symptoms, which lasted for a mean of nine hours, were thought to have been associated with a combination of fish histamine and wax ester poisoning. The incriminated fish used was eventually identified as castor oil fish (*Ruvettus pretiosus*). Fish histamine poisoning is not confined to any particular species but wax ester intoxication only results from the consumption of two fish species, making identification of the incriminated fish of great importance in ascertaining a cause. *Commun Dis Intell* 2004;28:83–85.**

*Keywords: fish histamine, foodborne disease, Ruvettus pretiosus, wax ester*

## Introduction

South Eastern Sydney Public Health Unit was alerted to a possible outbreak of foodborne illness associated with a catered work-site meal when seven persons were transported by ambulance to four inner-Sydney hospitals on 8 January 2001. The public health response comprised epidemiological and food safety investigations.

## Method

Individuals who had eaten the implicated meal were interviewed in the 24 hours following the notification. A questionnaire was developed which asked about symptoms experienced, the time of onset and the duration, the foods consumed, and about any exposure to hazardous substances during the course of their work. Cases were defined as persons who had not been ill prior to the meal and subsequently suffered from nausea, increased heart rate, or diarrhoea. Interview data were recorded and relative risks calculated using EpiInfo version 6.0.

The mobile caterer who had provided the work-site meal and the fish merchant were inspected in order to determine the level of hygiene, food preparation methods, storage practices (including potential for cross contamination), and the possibility of temperature abuse. The implicated fish was

ultimately traced back to the fishing vessel from which it had been caught. Food samples were sent to the NSW Health Division of Analytical Laboratories for microbiological and chemical testing.

## Results

### Epidemiological investigation

Twenty-eight people were interviewed including nine who fulfilled the case definition. Of the cases, five (56%) were men, compared to 14 (74%) of the 19 controls. The mean ages of both cases and controls were 34 years. For cases, the mean time between consumption and onset of illness (incubation period) was 59 minutes, with a median of 30 minutes (range 10–240). Five patients had recovered by the time of interview with a mean illness duration of nine hours (range 1–16).

The most common symptoms were headaches and hot flushes, followed by increased heart rate and diarrhoea (Table). Headache, hot flushes and increased heart rate occurred together in seven cases. The case with a prolonged incubation period of 240 minutes experienced only diarrhoea.

Epidemiological analysis clearly implicated the fish curry which had been eaten by all cases and six of the nineteen controls.

Corresponding author: Associate Professor Mark Ferson, Director, South Eastern Sydney Public Health Unit, Locked Bag 88, Randwick NSW 2031. Telephone: +61 29382 8233. Facsimile: +61 2 9382 8314. Email: fersonm@sesahs.nsw.gov.au

**Table. Symptoms experienced by nine cases**

| Symptoms             | Number |
|----------------------|--------|
| Headache             | 8      |
| Hot flushes          | 8      |
| Increased heart rate | 7      |
| Diarrhoea            | 5      |
| Nausea               | 5      |
| Abdominal cramps     | 4      |
| Rash                 | 4      |
| Fever                | 3      |
| Paraesthesiae        | 3      |
| Sore throat          | 1      |
| Numbness             | 1      |

### Food safety inspection

The mobile caterer and the merchant who provided the fish used in the curry were both inspected and defects were found in handling, including storage of fish at incorrect temperatures likely to lead to spoilage. A sample of the fish used in the curry was found to contain histamine at a level of 2,009 mg/kg (maximum allowable level up to 100 mg/kg). No organochlorine or organophosphorus pesticides were detected and all metal concentrations were found to be within the limits set out in the Australian Food Standards Code. The implicated fish had the common name of rudderfish, shared by a number of unrelated species, and was eventually identified by the NSW Department of Fisheries as *Ruvettus pretiosus*.

### Discussion

Based on symptoms of flushing and headache after a short incubation period, the food inspectors quickly arrived at a provisional diagnosis of fish histamine poisoning. The involvement of the wax ester in the fish flesh was only recognised later. The investigation was greatly hampered in this respect by the difficulties of identifying the fish involved. Fish histamine poisoning is not restricted to any specific fish or group of fish. However, the presence of high levels of wax esters in the flesh is species-specific and so diagnosis of this element of the illness would have been greatly assisted by an earlier, accurate identification of the fish species.

Due to the use of the common name 'rudderfish' by the food vendor and the fish monger, effort was initially expended in explaining illness attributable to two species generally accorded this name, *Kyphosus vaigensis* (family Kyphosidae) and *Centrolophus niger* (family Centrolophidae), both innocent of known association with food poisoning. The definitive identification of the fish as *Ruvettus pretiosus* (family Gempylidae) required the expertise of NSW Department of Fisheries.

Fish histamine poisoning is well recognised in the medical literature. Bacteria, introduced either from the marine environment or during handling, multiply and consume muscle histidine, converting it to histamine.<sup>1</sup> Consumption of histamine leads to a syndrome typified by cardiovascular symptoms (flushing, urticaria, hypotension and headache); gastrointestinal symptoms (abdominal cramps, diarrhoea and vomiting); and neurological symptoms (pain and paraesthesiae).<sup>1</sup> Prompt and continuing refrigeration of the fish inhibits the proliferation of the offending bacteria. The fish implicated in this outbreak contained 20 times the upper level of histamine allowed by the Australian Food Standards Code,<sup>2</sup> and severe toxicity is expected at this concentration.<sup>3</sup>

Wax ester poisoning is less well documented. The causative compounds are probably part of the fish's buoyancy system and do not seem to be intended as a deterrent to predators.<sup>4</sup> *R. pretiosus* has been used as a medicinal purgative by Polynesian and Melanesian people as part of their traditional practices.<sup>5,6</sup> The fish is known in English as the 'castor oil fish' as a result of the purgative action of its flesh.<sup>7,8</sup> However, according to one authority, 'the taste qualities of this fish are high. It is an excellent table fish',<sup>9</sup> and this may explain its continued use as food. It has a worldwide distribution at depths between one hundred and seven hundred metres;<sup>7</sup> one of the few places where it is actively sought as a food fish are the Comoro Islands where catches of Coelacanth are associated with the *Ruvettus* fishery.<sup>8</sup> Watery or oily diarrhoea is the only recorded symptom associated with the consumption of fish with high quantities of wax esters.<sup>7,8</sup> One record of experience of this states that the fish 'has a drastic effect....without however any pain preceding' and also that 'In the Line Islands it is called "Te icka na peka"—hardly translatable in polite English; but not to be too coarse we will say it means "the fish that makes you obey the call of nature in double quick time"'.<sup>5</sup>

## Conclusions

The pattern of symptoms experienced after consumption of the fish curry resulted from a combination of histamine contamination secondary to inadequate refrigeration and the high wax ester fraction of the fish from which the dish had been prepared. Neither fish histamines nor wax esters are broken down by cooking. The presence of histamines was verified by the laboratory tests while the wax ester component was inferred from the identity of the fish and from the existence of a single case that only experienced diarrhoea. The confusion of common names applied to unrelated, but similar looking, fish, only some of which are high in wax esters, contributes to the ongoing occurrence of this form of food poisoning.<sup>11</sup> Steps are being taken by food safety agencies and industry to improve this situation.<sup>11</sup> When outbreaks of fish-related intoxication occur, investigators should consider the possibility that there are multiple causative agents and seek prompt, accurate identification of the implicated fish.

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