A PRELIMINARY SURVEY ON CIGUATERA FISH POISONING IN THE MARSHALL ISLANDS

by

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INTRODUCTION

Ciguatera is a disease that can result from consumption of a variety of circumtropically distributed reef fishes (Tebano and McCarthy, 1991). This form of fish poisoning is especially common in the Caribbean and the Pacific.

Symptoms which normally appear within 2 to 32 hours of consumption include a range of gastrointestinal, cardiovascular, neurological and dermal disorders (Bagnis, 1973; Withers, 1982, Yasumoto *et al*, 1984). The most distinctive symptom is the reversal of temperature (warm things feel cold and vice versa).

The causative organism which was first promulgated by French and Japanese researchers has been disputed. *Gambierdiscus toxicus*, a dinoflagellate presumed responsible for ciguatera fish poisoning, was first isolated from detritus samples on dead corals in the Gambier Islands, French Polynesia (Yasumoto et al., 1977a,b). It is believed to produce the two primary toxins responsible for ciguatera fish poisoning; the water soluble maitotoxin and the lipid soluble ciguatoxin (*Yasumoto et al.*, 1979b; Bagnis *et al.*, 1980). Early studies showed that ciguatoxin could be accumulated in fish unaltered (Helfrich and Banner, 1963) and that once accumulated ciguatoxin would persist in fish for at least 2 to 3 years (Banner *et al*, 1966)

Ciguatera fish poisoning has been a problem in the Marshall Islands after World War II and it has worsened since then (Ruff, 1989). The most plausible explanation is the extensive military infrastructure and activities related to the 66 nuclear test explosions at Enewetak and Bikini Atolls between 1946 and 1958, and to the Kwajalein Missile Range (Ruff, 1989).

BACKGROUND

The Marshall Islands is made up of two chains of atolls, Eastern Ratak (sunrise) consisting of 15 atolls and Western Ralik (sunset) consisting of 16 atolls (Fig. 1). Together they comprise 1,152 islands and islets dispersed over 1,295,000 square kilometres of ocean in the central Pacific between 4°N and 14°N and 160°E to 173°E. The total land area is 181.3 sq. km (Tourism Office, 1991).

The climate is described as hot and humid with a mean temperature of 32°C and a range of 3°C. Ocassional high temperatures are cooled by the prevailing trade winds across the wide expanse of ocean. The mean rainfall is about 381 mm per month, the wettest months being October and November (Tourism Office, 1991).

The population of Marshall Islands is approximately 30,000, which almost doubled that of 20 years ago. The majority is concentrated in Majuro and Kwajalein. Majuro is the capital with a population of 12,000 people. Kwajalein is the missile testing range operated by United States Department of Defence (Heine, 1967).

The capital and projects are largely financed by the US Government grants. Main sources of income are earned through the Kwajalein Missile Range and copra. The fishing industry has considerable potential for larger scale development, and tourism has a high potential for growth. It is believed that the Marshallese have a strong link with Kiribati, Nauru, Ponape and other Micronesian states (Krammer and Nevermann, 1938).

The local diet had been predominantly vegetarian in the past, supplemented by fish and shellfish. The staple crops are coconut, breadfruit, pandanus, taro and arrowroot. These are now supplemented with imported food items like rice, chicken, turkey, ham, flour and many more. Because of ciguatera fish poisoning, the people are consuming more of the imported and canned fish.

METHODS

Two methods were used to collect information on ciguatera fish poisoning, namely: Interviews and Examination of Medical Records.

Interviews

Interviews were conducted around the main town of Uliga, some were made in the nearby communities of Rita and Delap. The fishermen and old people were asked to name the species which they think are toxic and where they have been caught. Interviews with various people who appeared to have an indepth knowledge of the problem were also noted.

Examination of medical records

Cases of fish poisoning were examined and determined on the symptoms shown on the records. Statistical results were obtained from a computerised record. Only two years results (1990 and 1991) were available.

RESULTS

The medical records obtained from the Marshall Islands Memorial Hospital on Uliga Island showed 67 cases of fish poisoning for 1990 and 28 cases for 1991 ending August (Table 1). The amberjack (*Seriola dumerili*), barracuda, surgeon fish (Acanthuridae), long-nosed snapper (*Lethrinus miniatus*) and the red snapper (*Lutjanus bohar)* were implicated to have caused ciguatera fish poisoning in the Marshall Islands (Appendix i).

It appears that between the years 1982 to 1987, cases of ciguatera had been increasing, suggesting that the problem had worsened (Table 2). However, the early 1990 results appear to suggest that the level of ciguatoxity has declined (Table 2) but perhaps the people are more aware of the potentially toxic fishes which they probably have tried to avoid eating.

Those islands which are known to have a ciguatera fish poisoning problem are Majuro (capital), Bikini, Kwajalein and Enewetak. The latter three islands have been the centre of nuclear testing by American military based in the Pacific. Information on ciguatera from other islands was not available at the time the survey was undertaken.

DISCUSSION

The outbreak of ciguatera fish poisoning has been attributed by the Marshallese to the nuclear test programmmes carried out in Kwajalein, Enewetak and Majuro after World War II. Outbreaks have also been noted on other atolls (Ruff, 1989). It had become a serious problem since.

Between 1982 and 1987, the reported annual ciguatera incidence rate for the Marshall Islands averaged over 300 cases per 100 000 people per year; more than three times the rate of any other Micronesian territory (Ruff, 1989). There is no doubt that this will remain a big problem in the Marshalls if not greater than any other Micronesian islands such as Nauru and Kiribati.

The toxic areas have not been mapped. Specific names of fishes toxic at each island have not been compiled. This makes it difficult for the local populace and visitors to know as where to/not to fish or what to eat and what not to eat.

Hospital results obtained were only from Majuro. Although the number of cases appeared small it is understood that a lot of cases were not reported as it is always the

situation in the Pacific Island countries (Tebano and McCarthy, 1991). The seriousness of the problem cannot be assessed as there is always a tendency by the islanders not to admit that there is a problem of ciguatera fish poisoning. The small number of cases recorded could also be partly due to the successful use of mannitol in the islands, although this inexpensive drug has not been approved by the World Health Organisation.

Reef blasting and dredging have not been linked with ciguatera fish poisoning, but these may also contribute to the problem, perhaps in a minor way. As in the case of Nauru reef blasting can be attributed to the onset and spread of ciguatera (Tebano, 1991c).

The people of Marshall Islands believe they can identify toxic fishes with their own traditional testing methods, some of which are the same as those used in Kiribati and Tuvalu. There are also cases where these methods have been misleading suggesting they are not very reliable. The scientific testing methods known so far are the 'poke test', 'mouse test' and 'mosquito test'. The former is now undergoing commercial production by an American company.

SUMMARY AND RECOMMENDATIONS

Ciguatera fish poisoning is a real problem in the Marshall Islands. Its effect on the socio-economics of the country should be seriously considered. The people of the Marshall Islands are buying more of the imported marine food products other than those locally available as a result.

There is a big need to identify toxic reef areas around each island as well as fish species which are potentially toxic. This will help reduce incidences from the present level.

Nuclear testing has been strongly linked with the onset and spread of ciguatera fish poisoning not only in the Marshall Islands but in other Pacific Islands as well. Although dredging and reef blasting have not been attributed to the flare and spread of the disease they should always be regarded as potential triggers. Such activities should be well considered as what effect they would have on the marine environment and its resources.

It would be of great importance to have a testing centre on each island whereby the fishermen can test the suspicious fishes. It would be even better if the fishermen owned a testing kit whereby they can test their catch while they are alive and thus discard the toxic ones.

It is highly recommended that there should be a public education programme on the biology, ecology, health and socio-economic aspects of this disease. It must be borne in mind that all reefs in the Pacific have the potential to become toxic any time at the slightest disturbance. So future development plans which may fall within the framework of reef disturbance should be avoided if possible.

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Table 1. Ciguatera fish poisoning cases for 1990 and 1991; Majuro Hospital.

1990

J	F	M	A	M	J	J	A	S	O	N	D	Total
5	9	5	6	9	3	5	8	3	4	5	5	67

1991

J	F	M	A	M	J	J	A	S	O	N	D	Total
4	7	-	3	3	3	2	6	na	na	na	na	28

na = not available

Table 2. Ciguatera cases recorded from 1982 to 1990.

1982	1983	1984	1985	1986	1987	1988	1989	1990	1991*
100	85	142	116	155	264	na	na	67	28

*year ending August

na = not available

Appendix i. Some common fishes of Marshall Islands.

Local Name	English Name	Species Name
Akor	Mullet	*Crenimugil heterocheilos*
Al	Wahoo	*Acanthocybium solandri*
Aolet	Jackfish (leatherskin)	Scomberoides lysan
Autak	Mullet	*Lisa vaigiensis*
Bako	Shark	*Carcharhinus melanopterus*
Bejrok	Rudderfish	*Kyphosus gibbus*
Beleo	Milkfish	*Chanos chanos*
Booklim	Grouper	*Epinephelus cyanopodus*
Bouran	Manta ray	*Mobula tarapacana*
Bue bue	Yellowfin tuna	*Thunnus albacare*
Bulak	Surgeonfish	*Naso lituratus*
Boko (all sharks)	Blacktip shark	*Carcharhinus* spp.
Boko	Grey shark	*Carcharhinus amblyrhynchos*
Bwine	Batfish	*Platax pinnatus*
Dribob	Butterflyfish	*Chaetodon auriga*
Ekbe	Snapper	*Macolor niger*
Ettiu-tou	Pompano	*Selar crumenopthalamus*
Iaibuki	Ray	*Dasyatis akatei*
Iiol	Mullet	*Valamugil buchanani*
Ikaidik	Rainbowrunner	*Elegatis bipinnulata*
Ilmok	Silverfish	*Gerres kapus*
Imen	Spotted ray	*Aetobatus narinari*
Imim	Triggerfish	*Rhinecanthus aculeatus*
Jaab	Snapper	*Lutjanus gibbus*
Jaad	Belonidae	*Ablennes hians*
Jalia	Long-nosed emperor	*Lethrinus elongatus*
	Red snapper	*Lutjanus bohar*
Jalia	**Long-nosed snapper**	*Lethrinus miniatus*
Jato	Snapper	*Lutjanus gibbus*
Jeblo	Snapper	*Lutjanus fulviflamma*
Jemjo	Ray	*Taeniura melanospilos*
Jilo	Dogtooth tuna	*Gymnosarda unicolor*
Joanuron, jowame	Grouper	*Plectropomus leopardus*
Joe, Matal, Jerobwe	Goatfish	*Parupeneus cyclostomus*
Jojo	Flying fish	*Cypselurus cyanopterus*
Jo-lok-mor	Goatfish	*Upeneus vittatus*
Kalimej	Bass grouper	*Cephalopholis argus*
Kiro	Grouper	*Epinephelus microdon*
Koko	Dolphin-mahimahi	*Coryphaena hippurus*
Labbo	Hump-headed wrasse	*Cheilinus undulatus*
Labbo	Wrasses	*Labridae (general)*
Lane	Jackfish	*Caranx papuensis*
Lejabil	Skipjack tuna	*Katsuwonus pelamis*
Lojebjeb	Grouper	*Epinephelus maculatus*
Lojkan	Marlin	*Makaira indica*
Lotkaan	Blue marlin	*Makaira mazara*

Louj	Jackfish	*Trachinotus bailloni*
Lwol	Soldierfish	*Holocentridae*
Manol	Jackfish	*Caranguoides fulvoguttatus*
Mao-mera-uram	Bluntheadparrotfish	*Scarus gibbus*
Mera	Parrotfish	*Scarus janthochir*
Mmaj, Dreb	Eels	*Enchelycore lichenosa*
Mmak	Halfbeak	*Platybelone argala*
Molajiktak	Jackfish	*Trachinotus blochii*
Momo	Grouper	*Epinephelus hexagonatus*
Muramor	Rabbitfish	*Siganus puntatus*
Muramor	Rabbitfish	*Siganus corallinus*
Muramor	Rabbitfish	*Siganus doliatus*
Net	Emperorfish	*Lethrinus lentjan*
Ni, Tua, Jujukop	**Barracuda**	*Sphyraena barracuda*
No	Stonefish	*Phrynelox nox*
Tak	Halfbeak	*Stronbylura incisa*
Ujinleeb	Sailfish	*Istiophorus platypterus*
-----	**Amberjack**	*Seriola dumerili*

Toxic fishes in bold letters.

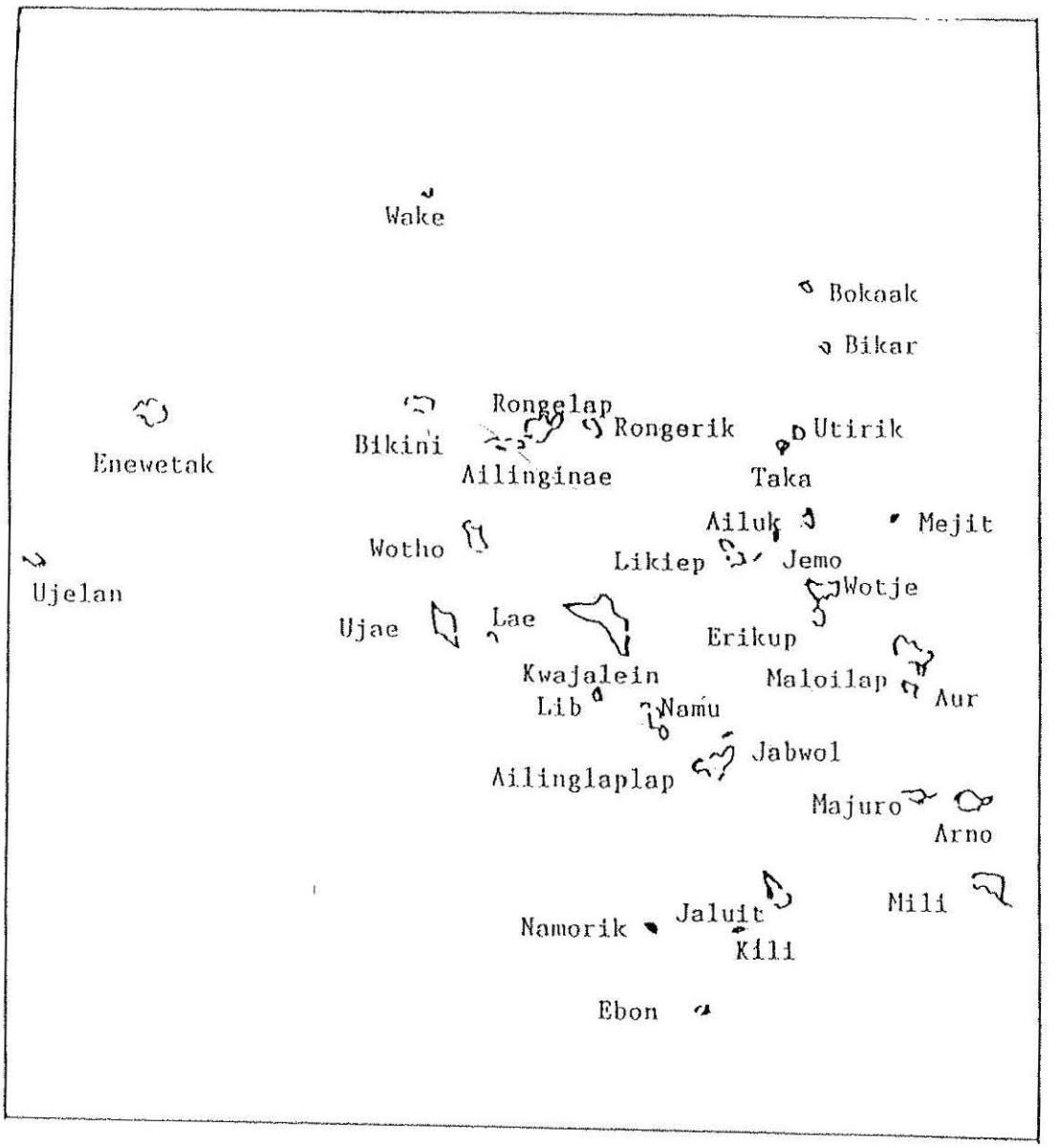

Figure 1. Map of the Marshall Islands.