

Short communication

Stings of edible jellyfish (*Rhopilema hispidum*, *Rhopilema esculentum* and *Nemopilema nomurai*) in Japanese waters

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Received 22 December 2005; accepted 1 June 2006

Available online 5 July 2006

Abstract

Three edible jellyfish *Rhopilema hispidum*, *R. esculentum* and *Nemopilema nomurai* are virulent to humans. We monitored one patient that was stung sequentially by these three species of jellyfish. The first species caused a persistent eruption, the second produced significant pruritus and the last induced only cutaneous symptoms rather than severe systemic disorders reported for its Chinese counterpart. The lesions of these jellyfish species are characteristic and common in workers harvesting medusae. There is no significant incidence of symptoms by ingesting these animals.

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Keywords: Edible jellyfish; Stings; *Rhopilema hispidum*; *Rhopilema esculentum*; *Nemopilema nomurai*

1. Introduction

The most common marine envenomations are inflicted by coelenterates. More than one hundred species are regarded as venomous and new additions to this list continuously appear (Kokelj et al., 1993).

Some jellyfish of the order Rhizostomeae are commercially exploited for human consumption as a delicacy in China, Japan, Korea and Southeast Asian countries. Recently, efforts have been progressing to produce a salted dried jellyfish product from the usually nonvenomous cannonball jellyfish (*Stomolophus meleagris*) in the United States and mildly venomous jellyfish, *Catostylus* sp. in Aus-

tralia (Wootton et al., 1982). The commercial value of these semidried products imported to Japan is about US \$50 million per year (Omori and Kitamura, 2004). In Japanese waters, three species of edible medusae, all of which are rhizostomes, are present: *Rhopilema hispidum*, *R. esculentum* and *Nemopilema nomurai*, locally known as ‘Hizen or Shiro kurage’, ‘Bizen or Aka kurage’ and ‘Echizen kurage’, respectively (Omori and Kitamura, 2004; K. Aramaki, a jellyfish fisherman in Yanagawa, personal communication).

R. hispidum and *R. esculentum*, both growing to ca. 70 cm in bell diameter and ca. 30 kg in wet weight, are fished for human consumption in the Ariake Sea, Kyushu, Japan during summer (Omori and Kitamura, 2004). The giant medusa *N. nomurai* (previously misnamed as *Stomolophus nomurai*), attaining a bell diameter to ca. 2 m and wet weight

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to ca. 200 kg, is found mainly in China but reaches the Japan Sea in summer and fall, sometimes in huge quantities, due to prevailing Tsushima Currents (Kawahara et al., 2006).

The Rhizostomeae sting has been described as a nonspecific local reaction with mild skin irritation (Fenner, 1993) but severe localized pain with erythema, urticaria and edema has been reported (Cleland and Southcott, 1965). However, specific available information on the sting of edible jellyfish is scarce. It varies from the potentially fatal reaction in the case of *N. nomurai* through 2 h long lesions of edema and severe stinging pain with a burning sensation in the case of *R. hispidum* (Othman et al., 1996, 1997; Zhang, 1987, 1988; Rifkin and Fenner, 1996). We found no prior information about *R. esculentum*.

The main goal of this paper is to provide a reliable and comparable description on usual dermatological effects of the stings of these edible species in Japan. Most stinging caused by the edible jellyfish is inflicted on fishermen who capture these animals. We were fortunate to encounter a person who was stung sequentially by the three Japanese edible rhizostomes and who could be continuously observed by us during his convalescence.

Case report: A healthy 25-year-old marine biologist with a negative personal history of allergy or atopy, who had frequently been stung by *R. hispidum*, *R. esculentum* and *N. nomurai* or by small pieces of their tentacles attached to nets while working, was observed for several weeks. The volunteer was seen by 5–10 observers familiar with reactions to jellyfish. As prior exposure did not endanger him, no treatment was given.

When stung by *R. hispidum* he experienced an immediate strong burning sensation, increasing for 3–4 h, with the simultaneous development of an erythematous vesicular eruption at the site of tentacle contact. The symptoms disappeared rapidly after recurring the following day as pruritic vesicles at the same site. These lesions in turn ruptured, but pigmentation persisted for more than 30 d before dissipating without scarring (Figs. 1A–C). Although this species is considered a stinging medusa, this report appears to be the first case of dermatitis caused by *R. hispidum*.

When our subject was stung by *R. esculentum*, instant mild pain was experienced followed by a strong pruritus lasting 30 min before complete resolution.



Fig. 1. One hour after *Rhopilema hispidum* sting (A), 72 h after (B) and 11 d after (C).

When exposed to *N. nomurai* tentacles, a very painful sting with a strong burning sensation occurred. An erythematous eruption with small vesicles appeared at the site of contact. All symptoms disappeared after 30 min, with no further consequences (Figs. 2A and B).



Fig. 2. Ten minutes after *Nemopilema nomurai* sting (A), 12 h after (B).

2. Discussion

As we previously commented, Rhizostomeae medusae are known to injure humans (Rifkin and Fenner, 1996). Each species has its own spectrum of sting severity ranging from a nonspecific local reaction with mild skin irritation to severe localized pain with erythema, urticaria and edema (Cleland and Southcott, 1965; Fenner, 1993; Silfen et al., 2003; Sendovki et al., 2005). *R. nomadica* that has invaded the Mediterranean Sea from the Red Sea through the Suez Channel (Galil et al., 1990) is well known for having noxious effects on fisheries and tourism due to its occurrence in swarms larger than 100 km (Yolfe and Baruchin, 2004), and due to its significant painful stings (Silfen et al., 2003; Sendovki et al., 2005). Other rhizotomes such as *R. pulmo* is usually considered completely harmless to humans, but has been recently reported to cause irritant contact dermatitis (Kokelj and Plozzer, 2002).

Our observations showed the same person responding mildly to envenomations by the three edible jellyfish species, with reactions different from those anecdotally reported (Othman et al., 1996, 1997; Zhang 1987, 1988; Zhang and Shede, 1996; Rifkin and Fenner, 1996). Our volunteer's sting by *R. hispidum* was persistent, *N. nomurai* contact did not cause serious systemic reactions, and *R. esculentum*, not previously report as venomous, stung him. These observations agree with those of the local Japanese authorities, who regard all three edible jellyfish species as mildly venomous. In fact, hundreds of Japanese seamen and harbor workers handle these medusae without any special care. Swarms of *N. nomurai* are now more frequent in Japanese coasts (Kawahara et al., 2006), thus the fishermen need to clean their nets of fouling tentacles often. We cannot ignore the fatal reports published on *N. nomurai* stings, so further evaluation will be required in order to assess the danger of this species for humans.

Only the venom from *R. hispidum* has been analyzed. It is a mixture of proteins with some heavy molecules (>37.5 kD) which have hemolytic as well as smooth muscle relaxant activity and can induce human cutaneous pain (Othman et al., 1996).

The stinging reported here in our patient are typical of those observed in current Japanese workers exposed to edible jellyfish. The vast majority of injuries occur in fishermen and workers processing these animals as food. Contrariwise only a very few reports of injuries have been reported in persons actually cooking or ingesting these animals. Persistent urticaria occurred in a 29-year-old housewife as she sliced and soaked dried jellyfish (Yaffe, 1968), ciguatera poisoning afflicted a 12-year-old girl after she ate imported jellyfish (Zlotnick et al., 1995), and occasional cramping and abdominal pain have appeared after jellyfish meals (Hsieh et al., 2001). An extreme anecdotic case was shown in an Australian male who suffered symptoms after he drank several ounces of isolated *Chironex fleckeri* tentacles by mistake (Fenner, 2001, personal communication). The throat swelling and breathing difficulties were hard for his physicians to distinguish from a post-episode emotional reaction. However, it seems that most oral exposures are innocuous, thus we conclude that the major medical problems occurring with edible jellyfish appear in workers from the fishery industry or those harvesting the medusae rather than in individuals preparing or eating the final product.

Acknowledgments

We thank Messrs. O. Yamakawa and K. Aramaki (set net and jellyfish gill net owners) for help in our field survey and providing information on jellyfish sting. This study was partially supported by the JSPS Research Grants (to SU) and Sasagawa Scientific Research Grant (to MK). This survey was conducted while HM was staying at Hiroshima University as a JSPS invitation research fellow no. S-05136. This is INIDEP Contribution no. 1417.

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