

Occurrence of Tetrodotoxin in Marine and Brackish Puffer Fish from East Malaysian Waters

Monaliza Mohd Din* and Samsur Mohamad

*Faculty of Resource Science and Technology,
Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak*

*Corresponding author: monaliza_mdin@yahoo.com

Abstract

Tetrodotoxin (TTX) is the toxic principle of puffer fish poisoning, a powerful and specific sodium channel blocker. TTX is exogenous in origin and accumulates in puffer fish through the food chain. Attempts were made to assess the toxicity, and verify toxin properties of marine and brackish puffers Lagocephalus lunaris, Tetraodon nigroviridis and Xenopterus naritus. The presence of TTX in puffer fish tissues were examined and verified by using mouse bioassay, Thin Layer Chromatography (TLC) and Gas Chromatography Mass Spectrometry (GC-MS). Toxicity assessment by mouse bioassay revealed that L. lunaris and T. nigroviridis was toxic (2.5 – 3.8 MU/g and 30.0 – 31.2 MU/g respectively). Meanwhile, the toxicity scores of toxin extracted from tissues of X. naritus were 2.0 – 2.8 MU/g and the toxin were considered too mild to be detected since the mice did not die within 30 minutes after intra-peritoneally injection. Analysis of TLC showed that tissue extracts of L. lunaris, T. nigroviridis and X. naritus were positive for TTX. From the GC-MS analysis, it was unambiguously concluded that L. lunaris, T. nigroviridis and X. naritus exhibited TTX in their skin and muscle.

Keywords: marine puffer fish, tetrodotoxin (TTX), mouse bioassay, TLC, GC-MS

Introduction

Puffer fish poisoning is probably the most common fish poisoning along the coasts of Asia (Chew *et al.*, 1983). Most of the poisoning cases have been caused by marine species with the presence of tetrodotoxin (TTX) as the principal toxin (Laobhripatr *et al.*, 1990). TTX is a lethal marine toxin with no known antidote (Hwang and Noguchi, 2007). In Malaysia, several studies related to puffer fish toxicology were carried out. In the early 1970s, three species of puffer fishes, *Lagocephalus lunaris*, *L. spadiceus* and *Arothron stellatus* collected from west Malaysian waters were found to be toxic and caused mouse lethality (Berry and Hassan, 1973). However, detailed toxin properties verification was not carried out during these studies. Simon *et al.* (2009) stated that puffer toxicity may be attributed to symbiotic bacteria.

This study was carried out to examine the toxicity status of puffer fishes in selected areas in Sabah and Sarawak in order to ensure safe consumption of puffer