A STUDY ON HISTAMINE PRODUCTION AND CONTROL MEASURES FOR FISH AND DRIED-FISH AND THE EFFECTSOF PROCESSING ON HISTAMINE

By

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ABSTRACT

Fish contaminated with histamine has become a health concern as some humans show allergy-like reactions when they consume fish contaminated with histamine. A study was carried out to estimate the histamine concentrations of market fish and fish products in Sri Lanka, isolate and identify histamine producing bacteria and observe the effects of processing on histamine.

Samples of fish and fish products tested for histamine by TLC and fluorometry showed a correlation coefficient of 0.88. Fresh skipjack tuna showed the highest mean histamine concentration of 478±91 ppm. Fresh tuna and herring, dried skipjack and herring and Maldive fish showed a mean histamine concentration of above 100 ppm while fresh inland fish and "jadi" contained less than 50 ppm. Inner portions of Maldive fish contained a mean histamine concentration of 190±11 ppm compared to 90±10 ppm in outer portions of about 2 mm depth. Canned mackerel contained a mean histamine concentration of 132±127 ppm. Canned fish manufactured for Sri Lanka appeared to contain histamine concentrations higher than in canned fish manufactured for other countries.

Sri Lanka Standards Specifications for fresh, dried and canned fish do not stipulate histamine concentrations. Standards Specifications for Maldive fish and canned fish curry stipulate the maximum tolerance limit as 200 and 100 ppm respectively. The United States Food and Drugs Administration (USFDA) and the European Economic Community directives, specify a maximum tolerance limit of 50 ppm histamine in fish. Histamine concentrations observed in most of the market dried, canned and Maldive fish were in the unacceptable range.

Histamine producing bacteria isolated from fish and fish products and identified, included *Micrococcus* and *Flavobacterium* spp which have not been identified as histamine producers before. Laboratory preparation of dried-fish showed that beheaded, gutted, salted and sun-dried fish showed the lowest histamine concentration. Maldive fish prepared from dorsal loins of skipjack showed histamine concentrations higher than in the ventral loins.

The belief that cooking of red-blooded fish with "goraka", leaves of "kathurumurunga" or "murunga" or coconut milk reduces the heaty effects of fish was tested. Cooking of fish with an aqueous extract of "goraka", "siyamabala" and "biling" showed a mean percentage histamine reduction of 92±1, 78±1 and 68±1 respectively. Tartaric acid in "goraka" was considered responsible for reduction of histamine in fish. Cooking of fish with an aqueous extract of "kathurumurunga" and "murunga" showed a percentage mean histamine reduction of 57±1 and 59±1 respectively. Cooking of fish with coconut milk showed no effect on histamine.

Sunlight and nitrogen atmosphere did not suppress the growth of histamine producing bacteria in Niven's agar medium. The bacteria were unable to grow at a temperature above 70 °C and below 10 °C, sodium chloride at a concentration of 14% or higher, pH below 4 and above 9 and extracts of "murunga" and "kathurumurunga" leaves at a concentration of 80% or above. A test of the effect of aqueous and petroleum ether extractions of "goraka", "siyambala" and "biling" on the growth of bacteria in Niven's medium showed that the petroleum ether extracts had a slightly higher inhibitory effect when compared with aqueous extracts. Petroleum ether extract of "goraka" showed the highest inhibitory effect.

Frying of fish in coconut and soya oil showed that frying at high temperatures (300 °C) either destroyed histamine or dissolved histamine in oil. Dipping in coconut water showed no effect on histamine in fish in contrary to the common belief. A simple spectrophotometric method was developed to estimate histamine in culture media contaminated with histamine and extended to estimate histamine in fish. This method would enable estimation of histamine in fish using less expensive equipment and chemicals in relatively less time.