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Fat content and EPA and DHA levels of selected marine, freshwater fish and shellfish species from the east coast of Peninsular Malaysia

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Abstract: The total lipid contents and the concentration of eicosapentaenoic (EPA) and docosahexaenoic (DHA) fatty acid of fourteen selected marine, three freshwater fish species, four shellfish species and two selected canned fish species of East Coast of Peninsular Malaysia were determined. The fat content of all samples ranged from 1.01 % to 15.83 % with silver catfish reported to have the highest value. Most of the fish had fat amounts lower than 10% of their total weight. In general, DHA concentrations (50.50-165.21 µg/g) were significantly higher than EPA (11.12-55.38 µg/g) in all of the fish species analyzed. Among all marine fish species, the sixbar grouper recorded the highest concentration of DHA (165.21 µg/g) while barramundi had the highest concentration of EPA (55.38 µg/g). In conclusion, all fish and shellfish species are considered a good source of EPA and DHA, representing a very valuable essential nutrient for maintenance of human health.

Keywords: Fat content, marine fish, shellfish, eicosapentaenoic (EPA), docosahexaenoic (DHA).

Introduction

Eicosapentaenoic (EPA) and docosahexaenoic (DHA) are the two main omega-3 fatty acids typically found in marine fish and originate from the phytoplankton and seaweed that are part of their food chain. Previous research indicates that omega-3 fatty acids are associated with lowering the occurrence of hypertrigliceridaemia (Cavington, 2004), inflammation (Calder, 2001), rheumatoid arthritis- and other diseases. Besides these functions, EPA and DHA are highly concentrated in the brain and appear to be particularly vital for early development of cognitive function and visual sharpness (Birch *et al.,* 2000) and also can act as major components of cell membranes and precursors of the eicosanoids hormones (Ng, 2006). In addition, these fatty acids have been effectively proven to be useful in the prevention and treatment of wide variety of disorders including hypertension, eczema, psoriasis, osteoporosis, breast cancer, asthma and allergy (Guil-Guerrero *et al*., 2011). Hence, DHA and EPA provide a wide range of health benefits, both by means of fish ingestion, or through the consumption of dietary supplement.

Previous epidemiological studies have shown that minimal intake of the long chain omega-3 polyunsaturated fatty acids, EPA and DHA are linked to having an increased risk of coronary heart disease (Albert *et al*., 2002; Hu *et al.*, 2002; Abu and Oluwatowoju, 2009). The importance of omega-3 fatty acids in human nutrition is widely recognized (Simopoulos, 2004), especially HUFA with 20–22 carbons and 5 or 6 double bonds and particularly DHA and EPA. The potential of these compounds in the prevention of certain cardiovascular diseases (Connor, 2000) and other chronic diseases have also been documented (Innis, 2000; Moyad, 2005). The benefits of n-3 PUFA (polyunsaturated fatty acids) are associated with its role in the synthesis of prostaglandins, thromboxanes, and leukotrienes (Kapoor and Patil, 2011).

In the perspective of functional food, EPA and DHA fatty acids provide the taste and texture of many foods. Variations in fatty acid composition may occur due to fluctuations in the quality and amount of food available, especially for phytoplankton (Ackman, 1967). The nutritional recommendations for daily intakes of ω-3 from DHA and EPA ranged between 0.5 and 1.6 g for healthy adults, infants, pregnant and lactating women published by several international scientific authorities (Loukas *et al*., 2010).

The fatty acid composition of the edible portion of fish is affected by many factors, such as species,

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