



Occurrence and distribution of endocrine-disrupting chemicals in mariculture fish and the human health implications

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ABSTRACT

The presence and distribution of endocrine-disrupting chemicals (EDCs) in the mariculture fish from Pulau Kukup, Johor of Malaysia have been studied along with the impact on human health. Six different species of mariculture fish were collected, due to their high consumption in the Asian region—especially Malaysia, to assess their levels of EDCs. The highest concentration of EDCs detected in the muscle was dexamethasone (2.37–15.84 ng/g) and (0.77–13.41 ng/g), in the liver was dexamethasone (<2.54–43.56 ng/g) and progesterone (2.23–9.78 ng/g), and in the reproductive organ are dexamethasone (<2.54–37.23 ng/g) and caffeine (0.21–18.92 ng/g). The human health risk assessment in the current study suggested that there is no potential risk to the consumer because the hazard index was below 1 (HI < 1). The present study provides information on the pollution profile of EDCs and the associated human health risk with EDCs in mariculture fish.

1. Introduction

Hormones, pesticides and pharmaceutically active compounds (PhACs) are classified as multi-residues of endocrine-disrupting chemicals (EDCs) and these organic pollutants have become a major issue since they accumulate widely in aquatic organisms and cause malfunctioning of the endocrine system and other bodily functions of the organism (Huber et al., 2016; Álvarez-Muñoz et al., 2015). EDCs also have the ability to penetrate and cause harmful biological impacts at low doses (ng/L or µg/L) on humans and animals. Besides wastewater treatment plants (WWTP), waste from other urban and industrial activities, animal husbandry, agriculture, and aquaculture are among the major sources of EDCs in an aquatic environment (Melvin, 2017; Frédéric and Yves, 2014; Gaw et al., 2014). Most emerging pollutants pose a risk to organisms and human health, affecting the development, growth, reproduction and behaviour of human beings, wildlife, and aquatic organisms, even at low concentrations (Omar et al., 2018; Aris et al., 2014). Exposure of EDCs can cause obesity, diabetes, breast cancer, prostate cancer, and lead to abnormal development of male

reproductive organ (Diamanti-Kandarakis et al., 2009). Furthermore, EDCs may alter the endocrine and immune systems and exhibit bioaccumulation in aquatic organisms, thus deteriorating the quality of seafood (Guedes-Alonso et al., 2017). The toxicity of chemicals to aquatic organisms usually correlates with the uptake and accumulation of these chemicals in living tissues (Yao et al., 2016).

Global consumption of seafood has been on a rise since 1950 s and is expected to keep growing in the decades to come (Cunha et al., 2017). FAO (2019) reported showed that the fish production and fish supply in Asia is the highest in the world. Owing to the high demands of fish worldwide, especially among Asians, whose consume a large quantity of fish as part of their everyday diet, coupled with the occurrence and distribution of organic emerging pollutants in edible fish species, precautionary measures need to be taken for ecology and human health (Cheung et al., 2008). EDCs may alter the endocrine and immune systems and exhibit bioaccumulation in aquatic organisms, thus deteriorating the quality of seafood (Guedes-Alonso et al., 2017). Previous report observed steroid hormones, phenolic compounds, and pharmaceutical compounds in fish samples (Omar et al., 2019). Pulau Kukup,

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