ABSTRACT

The Characterization of Endocrine Disruption in the Freshwater Systems of Trinidad

Warren Jason Thomas

The aim of the present study was to determine the nature and level of endocrine disruptors (EDs) in surface waters receiving sewage effluent and to characterize the broad endocrine disruption effects in wild populations of the common guppy (*Poecilia reticulata*) in the freshwater systems of Trinidad. The male guppy was chosen as the model organism to test the level of disruption in primary and secondary sexual characteristics. The Arima and San Fernando sewerage treatment plants (STPs), were identified as the major point sources through which EDs are likely to enter the surface waters. Oestrone (E1), 17β-oestradiol (E2) and 17α-ethinyloestradiol (EE2) were the three major environmentally potent endocrine disruptors identified and quantified using a combination of solid phase extraction, silica gel column chromatography, and gas chromatography-mass spectrometry. The instrumental analysis demonstrated that mean values found for the aforementioned ranged from 0.04ng/L to 1,912ng/L. There were no significant signs of endocrine disruption in the male guppy at the secondary sexual characteristics level; that is, length of fish, weight of fish, length of gonopodium, gonopodium index, gonadosomatic index and percentage orange body colouration. However stereo-histological analysis of the gonads of specimens from below both STPs did reveal there is evidence at the organ and tissue level that some disruption exists, as highlighted in the arrest of spermatogenesis seen in the gonads of the guppy in at least two fish, and the trend towards disruption seen in 10% of the fishes sampled.

Keywords: Endocrine disruption; guppy; sewage treatment plants (STPs); oestrone (E1); 17β-oestradiol (E2); 17α-ethinyloestradiol (EE2); gas chromatography-mass spectrometry; stereo-histological; spermatogenesis