

Effect of Venlafaxine on Swimming Behavior of Fathead Minnows After 24-hour Exposure

ABSTRACT

Depression is a mood altering disorder that affects 350 million people globally. To combat the prevalence of depression, antidepressants are prescribed to restore the balance of neurochemicals in the brain. Venlafaxine, with over 15 million prescriptions in the US in 2013, is a serotonin and norepinephrine reuptake inhibitor (SNRI) antidepressant. Serotonin and norepinephrine are associated with alertness, energy, and happiness, thus increasing levels in the brain promotes improved mood in patients. However, investigating the environmental release and effects of venlafaxine is important to determine potential adverse effects on non-target organisms. Venlafaxine, as well as other pharmaceuticals, enters freshwater ecosystems from wastewater effluent recorded at $\mu\text{g/L}$ concentrations because wastewater treatment methods do not completely remove excreted venlafaxine. Removal efficiencies at the Ithaca Area Wastewater Treatment Facility (IAWWTF) for venlafaxine were reported at 0% in May 2015. IAWWTF receives above average antidepressant loads partly due to the two local universities in the area. The IAWWTF discharges effluent into the southern portion of Cayuga Lake, exposing freshwater ecosystems and local recreational waters to the antidepressant. Our study aims to test the effects of venlafaxine on juvenile fathead minnow (*Pimephales promelas*) swimming patterns at an environmentally relevant concentration of $0.2 \mu\text{g/L}$ in addition to concentrations of 2 and $20 \mu\text{g/L}$ for 24 hours. EthoVision video tracking software was used after the dosage period to determine altered swimming activity, such as twitching, velocity, thigmotaxis, schooling, location-based heat maps.