

USE OF TRICLOSAN AND POLYCYCLIC MUSKS AS INDICATOR CHEMICALS FOR DOMESTIC WASTEWATER

T. Ebihara¹, LFR Inc., and J.L. Strickland, CDM

¹LFR Inc.

630 Tollgate Road, Suite D

Elgin, IL 60123 USA

ABSTRACT

Triclosan (TCS) and two polycyclic musks were evaluated as indicator chemicals in untreated and treated domestic wastewater sources in eastern Kansas. Triclosan (TCS), or 5-chloro-2-(2,4-dichlorophenoxy) phenol (CAS No. 3380-34-5), is a broad-spectrum antimicrobial agent used in household hand soaps. The primary synthetic polycyclic musk fragrances used in household consumer products are 1,3,4,6,7,8-Hexahydro-4,6,6,7,8,8-hexamethyl-cyclopenta (γ)-2-benzopyran (HHCB, CAS No. 122-05-5) and 6-Acetyl-1,1,2,4,4,7-hexamethyl-1,2,3,4-tetrahydro-naphthalene (AHTN, CAS No. 1506-02-1). TCS, HHCB, and AHTN are emerging pollutants monitored by the United States Geological Survey (USGS) in the Toxic Substances Hydrology Program. Compounds such as TCS, HHCB, and AHTN have been suggested as potential indicators of human fecal contamination.

Chemical monitoring was conducted at three sites over a three-week period and indicator chemical concentrations were determined using solid-phase extraction and gas chromatographic-mass spectrometry. Concentration of each chemical indicator at each sampling location (n=12 to 19) was observed within a relative standard deviation (RSD) of 9 to 28% for untreated and treated domestic wastewater, indicating stable source concentrations during dry weather conditions. Average influent TCS for individual wastewater treatment plants ranged from 0.021 to 0.028 mg/L (9 to 15% RSD) and effluent TCS ranged from 0.00098 to 0.0013 mg/L (14 to 24% RSD). Similar results were observed for HHCB and AHTN. In addition, a statistically significant difference in the concentration ratio of HHCB:TCS was observed in untreated (0.318 ± 0.083) versus treated wastewaters (1.430 ± 0.378) using a paired t-test ($p < 0.0001$, $n = 46$). These data suggest that the contribution of untreated or treated domestic wastewater to urban streams may be determined based overall TCS concentration and on the HHCB:TCS concentration ratio.

KEYWORDS

Chemical indicator, domestic wastewater, Triclosan, polycyclic musks