

## **ABSTRACT**

**THESIS:** Removal of Antibiotics via Chlorination and Sand Filtration During Treatment of Municipal Wastewater

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Wastewater treatment plants (WWTPs) have been identified as ‘hot spots’ of antibiotics release to the environment. Treatment operations at WWTPs may remove a significant proportion of antibiotics from influent wastewater; however, the effects of tertiary treatment processes on antibiotics removal are not well understood. In this study, wastewater samples were collected from a WWTP in Muncie, IN and analyzed for concentrations of sulfamethoxazole, trimethoprim, ciprofloxacin, and erythromycin using EPA Method 1694. Removal efficiencies were calculated for: (1) complete wastewater treatment including conventional primary and secondary treatment, and tertiary treatment consisting of sequential silica filtration/chlorination; and (2) tertiary treatment only. A two-sample t-test was conducted to analyze the primary influent/tertiary effluent and secondary effluent/tertiary effluent data sets to determine if the treatment methods significantly reduced the mean concentrations of the antibiotics. The antibiotics were removed at 5.5 - 30% efficiency when the complete treatment was applied; however, concentrations increased (11 - 71%) following tertiary treatment. The t-test for trimethoprim primary influent/tertiary effluent samples showed that the treatment resulted in a

statistically significant  $27.3 \pm 24.4$  ng/L reduction in mean concentration. No other results were statistically significant. The results suggest that certain factors had affected the calculated removal efficiencies which are commonly unaccounted for in similar studies. Possible factors, including the presence of conjugate metabolites that were retransformed into parent compounds, variable influent loading among samples, sample matrix effects, and statistical analysis are discussed to provide direction for future studies.