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CONCENTRATIONS AND REMOVAL OF PHARMACEUTICAL COMPOUNDS AT THREE WASTEWATER PLANTS IN NEW YORK STATE, 2003-2004

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ABSTRACT: Twelve influent and 12 effluent samples were collected during 2003-2004 at each of three wastewater-treatment plants in New York State; two use activated sludge (AS) and one uses a trickling filter (TF) treatment process. The samples were analyzed for dissolved concentrations of 24 compounds by liquid chromatography/mass spectrometry. One or two samples from each site were collected as a 24 hour flow-weighted samples after biological treatment and filtering in addition to influent and effluent samples. Results indicate that 1) several pharmaceuticals are frequently present in influent entering all three plants, 2) chemical concentrations in influent differ among the plants, 3) the AS plants lowered the concentrations of many pharmaceuticals more than the TF plant, and 4) much of this decrease occurred during biological treatment. Thirteen of the pharmaceuticals were detected in more than 35 percent of the influent samples. Non-prescription compounds and metabolites including acetaminophen, caffeine, and cotinine were routinely detected in influent at concentrations greater than 1 ug/L, but most prescription compounds were detected at concentrations around 0.1 ug/L. Median influent concentrations for acetaminophen, codeine, and fluoxetine (10, 10 and 100 ug/L, respectively) at one AS plant were at least 10 times greater than those at the other two plants; this reflects differences in the sources. Comparison of influent concentrations with effluent concentrations indicates that concentrations of some compounds (including 1,7-dimethylxanthine, cotinine, acetaminophen, caffeine, and codeine) were decreased by 90 percent or more at AS plants and by 70 percent or less at the TF plant. Some compounds (including carbamazepine, dehydronifedipine and trimethoprim) were not removed by either type of plant. Analysis of samples collected before and after biological treatment, filtering, and disinfection, indicates that most of the concentration decrease occurs during biological treatment and that the filtration and disinfection processes have little effect on concentrations of most pharmaceuticals.

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