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Sources of pharmaceutical pollution in the New York City Watershed

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ARTICLE INFO

Article history:

Received 24 September 2007

Received in revised form

2 January 2008

Accepted 4 January 2008

Available online 15 February 2008

Keywords:

Pharmaceuticals

Surface water

Wastewater effluent

ABSTRACT

An investigation was carried out in the New York City Watershed for the presence of selected pharmaceuticals. In four seasonal sampling events between August 2003 and May 2004, surface water was collected from eight reservoir keypoints and effluent was collected from four wastewater treatment plants. We evaluated the following twelve compounds: amoxicillin, atenolol, caffeine, carbamazepine, cephalexin, estrone, 17 α -ethinylestradiol, 17 β -estradiol, ibuprofen, sulfamethoxazole, trimethoprim, and valproic acid. In the treated effluents, carbamazepine was detected most frequently (100%; concentration range: 22–551 ng/L), followed by atenolol (94%; ND — 14,200 ng/L), trimethoprim (83%; ND — 37,000 ng/L), ibuprofen (61%; ND — 14,600 ng/L), and caffeine (49%; ND — 37,200 ng/L), while estrone was detected once (56 ng/L). In the reservoir keypoint samples, only ibuprofen (2.5%; ND — 932 ng/L) and caffeine (2.9%; ND — 177 ng/L) were detected. The other analytes were not detected in any sample. It is expected that investigation of other wastewater treatment plants in the New York City Watershed would show that their effluents are also a potential source of pharmaceuticals, but that these pharmaceuticals are unlikely to be detected in the Watershed's surface waters.

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1. Introduction

Pharmaceuticals have been detected in wastewater treatment plant effluents, surface water, ground water, and drinking water. Most drug classes have been documented, including analgesics, antibiotics, antiepileptics, antihypertensives, anti-

septics, beta-blocker heart drugs, contraceptives, hormones, lipid-lowering drugs, psychotherapeutics, and X-ray contrast media (Halling-Sørensen et al., 1998). According to the National Association of Chain Drug Stores, Americans filled over 3.2 billion prescriptions in 2003, an increase of over 1 billion since 1995 (NACDS, 2005). U.S. spending for prescription drugs is

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Abbreviations: NYSDOH, New York State Department of Health; NYC, New York City; WWTP, wastewater treatment plant; HPLC, high performance liquid chromatography; MS, mass spectrometer; ESI, electrospray ionization

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