



EPA Pilot Study of PPCPs in Fish Tissue

Obtaining environmental data on emerging contaminants is a priority area of interest for EPA, particularly the group of chemicals that includes pharmaceuticals and personal care products (PPCPs). Pharmaceuticals are prescription and over-the-counter medications, whereas personal care products include other consumer chemicals that are non-medicinal, such as the fragrances (musks) in lotions and soaps. In 2006, the Office of Science and Technology within EPA's Office of Water initiated a pilot study to investigate the occurrence of PPCP chemicals in fish tissue. This fact sheet describes the study and identifies which PPCP chemicals occurred in the fish.

Conducting the study involved the following activities:

- Sampling fish from 5 effluent-dominated streams in various parts of the country and one reference site away from human sources of pollution.
- Collecting 18-24 adult fish of the same species at each site near wastewater treatment plant discharges and forming 6 composite samples.
- Teaming with Baylor University to analyze fillet and liver tissue from each set of 6 fish composite samples for 24 pharmaceutical compounds and fillets only for 12 personal care products.



PPCP Fish Pilot Study Schedule

- Sampling completed in November 2006
- Chemical results reviewed in June 2008
- Report to be completed in Fall 2008

Next Steps

- EPA is extending the coverage for PPCP sampling to a representative set of about 150 urban river sites as part of its National Rivers and Streams Assessment. Field teams are collecting water and composite fish samples at these sites during 2008 and 2009.
- EPA's National Exposure Research Laboratory in Cincinnati will analyze the water and fish fillet samples for an expanded list of PPCP chemicals. They will also analyze the fish fillets for persistent contaminants, including mercury, selenium, PCBs, pesticides, and flame retardants (PBDEs).



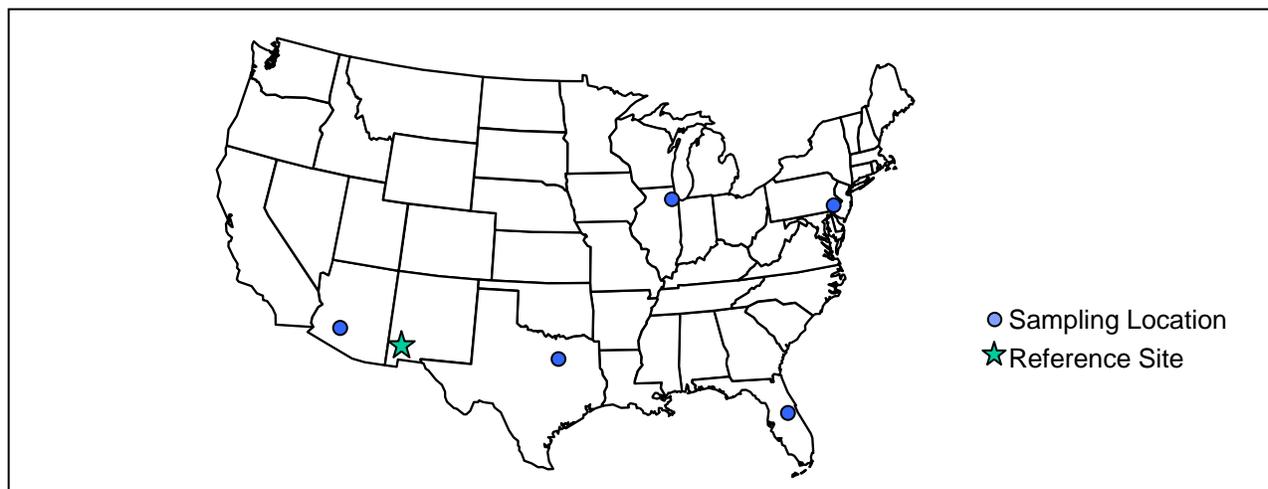
Chemicals for PPCP Fish Tissue Pilot Study

Pharmaceuticals Using HPLC-MS/MS Method	
CHEMICAL	USE
Acetaminophen	Analgesic
Atenolol	Anti-hypertension
Caffeine	Stimulant
Carbamazepine	Anti-seizure
Cimetidine	Anti-acid reflux
Codeine	Analgesic
Diltiazem	Anti-hypertension
Diphenylhydramine	Antihistamine
Erythromycin	Antibiotic
Fluoxetine	Antidepressant
Gemfibrozil	Antilipemic
Ibuprofen	Analgesic
Lincomycin	Antibiotic
Metoprolol	Anti-hypertension
Miconazole	Anti-fungal
Norfluoxetine	Antidepressant
Propranolol	Anti-hypertension
Sertraline	Antidepressant
Sulfamethoxazole	Antibiotic
Thiabendazole	Antibiotic
Trimethoprim	Antibiotic
Tylosin	Antibiotic
Warfarin	Anticoagulant
1,7-dimethylxanthine	Antispasmodic

Personal Care Products Using GC-MS/MS Method	
CHEMICAL	USE
Benzophenone	UV filter
Celestolide (ADBI)	Fragrance/Musk
Galaxolide	Fragrance/Musk
<i>m</i> -toluamide (DEET)	Insecticide
Musk Ketone	Fragrance/Musk
Musk Xylene	Fragrance/Musk
Octocrylene	UV filter
<i>p</i> -Nonylphenol	Surfactant
<i>p</i> -Octylphenol	Surfactant
Tonalide	Fragrance/Musk
Triclosan	Antimicrobial
4-methylbenzylidene camphor (4-MBC)	UV filter



PPCP Fish Tissue Pilot Study Sampling Locations



PPCP Fish Tissue Pilot Study Samples

STATE	SAMPLING LOCATION	DATE	SPECIES	# OF FISH
AZ	Salt River, Phoenix	Nov. 2006	Common carp	18
FL	Little Econlockhatchee River, Orlando	Oct. 2006	Bowfin	17
IL	North Shore Channel, Chicago	Sep. 2006	Largemouth bass	24
NM	East Fork Gila River (<i>Reference Site</i>)	Nov. 2006	Sonora sucker	24
PA	Taylor Run, West Chester	Aug. 2006	White sucker	24
TX	Trinity River, Dallas	Oct. 2006	Smallmouth buffalo	18

Pharmaceutical Results

- No target pharmaceutical compounds were detected in any of the composites collected at the reference site.
- Seventeen of the 24 pharmaceutical compounds were not detected in any of the fillet or liver samples from the five sites located on effluent-dominated streams.
- All seven pharmaceutical compounds detected in the tissue samples occurred in livers while only five were detected in fillets.
- The pharmaceuticals that occurred most frequently were diphenylhydramine, norfluoxetine, and sertraline.
 - Norfluoxetine and sertraline (antidepressants) both occurred in livers at all 5 sites and in fillets at 3 and 2 sites, respectively.
 - Diphenylhydramine (antihistamine) occurred in livers at 4 sites and in fillets at 3 sites.

Pharmaceutical Chemicals

Not Detected in Fillet and Liver Tissue

Chemicals Not Detected	Use
Acetaminophen	Analgesic
Atenolol	Anti-hypertension
Caffeine	Stimulant
Cimetidine	Anti-acid reflux
Codeine	Analgesic
Erythromycin	Antibiotic
Ibuprofen	Analgesic
Lincomycin	Antibiotic
Metoprolol	Anti-hypertension
Miconazole	Anti-fungal
Propranolol	Anti-hypertension
Sulfamethoxazole	Antibiotic
Thiabendazole	Anti-fungal
Trimethoprim	Antibiotic
Tylosin	Antibiotic
Warfarin	Anticoagulant
1,7-dimethylxanthine	Antispasmodic



North Shore Channel
Chicago, Illinois

Pharmaceutical Chemicals Detected in Fillet and/or Liver Tissue

Detected Chemical	Use	Number of Composites with Detections (N=30)	
		Fillet	Liver
Carbamazepine	Anti-seizure	6	6
Diltiazem	Anti-hypertension	8	16
Diphenylhydramine	Antihistamine	18	23
Fluoxetine	Antidepressant	0	11
Gemfibrozil	Antilipemic	0	8
Norfluoxetine	Fluoxetine metabolite	12	26
Sertraline	Antidepressant	12	23

Personal Care Product Results

- No target personal care product chemicals were detected in any of the composite samples collected at the reference site.
- The personal care product (PCP) results are only for fish fillets. Current analytical techniques for PCPs are subject to interference from fat and other substances found in fish liver.
- Eight of the 12 personal care product chemicals were not detected in any of the fillets samples from the five sampling locations on effluent-dominated streams.
- Three personal care product chemicals occurred in fish fillets at all 5 sites: galaxolide and tonalide, which are both fragrances (musks), and benzophenone, which is an ultraviolet radiation filter used in sunscreens.

Personal Care Product Chemicals Not Detected in Fillet Tissue

Chemicals Not Detected	Use
Celestolide (ADBI)	Fragrance/Musk
<i>m</i> -toluamide (DEET)	Insecticide
Musk Ketone	Fragrance/Musk
Musk Xylene	Fragrance/Musk
<i>p</i> -Nonylphenol	Surfactant
<i>p</i> -Octylphenol	Surfactant
Triclosan	Antimicrobial
4-methylbenzylidene camphor (4-MBC)	UV filter



Personal Care Product Chemicals Detected in Fillet Tissue

Detected Chemical	Use	Number of Composites with Detections (N=30)
		Fillet
Benzophenone	UV filter	24
Galaxolide	Fragrance/Musk	29
Octocrylene	UV filter	3
Tonalide	Fragrance/Musk	25

For more information contact: Leanne Stahl
 U.S. Environmental Protection Agency
 OW/OST
 1200 Pennsylvania Avenue, N.W.
 Washington, DC 20460
 (202)566-0404
stahl.leanne@epa.gov

Visit the study website at: www.epa.gov/waterscience/ppcp/studies/fish-tissue.html