

Analysis of Pharmaceuticals & Personal Care Products

USEPA New England Laboratory

Peter Philbrook (EIA)

&

Hilary Snook (ECA)

PPCPs What Are They?

- ⚡ Prescription medications
- ⚡ Over The Counter medication
- ⚡ Shampoo, perfume, insect repellent, sunscreen, detergents
- ⚡ Coffee, tea, soft drinks, nicotine...

History

- ⚡ 1975 detection of Clofibric Acid
- ⚡ Subsequent Investigations found Aspirin, Caffeine, Nicotine
- ⚡ Waste Water Treatment Plants are not effective in removal

Last Decade

- ⚡ Numerous studies have found anthropogenic compounds
- ⚡ USGS Study March 2002
- ⚡ 139 Streams
- ⚡ 95 Organic Wastewater Contaminants

Sources

- ⚡ Household discharges to WWTP or Septic Systems
- ⚡ Hospitals
- ⚡ Terrestrial Run-Off from Confined Animal Feeding Operations (CAFOs) Veterinary Antibiotics and pharmaceuticals

Improvements in Technology

- ⚡ Solid Phase Extraction Enrichment
- ⚡ Detection by LC/MS

Solid Phase Extraction Manifold



HPLC / MS Instrumentation



ESI + Target Compounds

Compound	Application	RL (ug/L)
Acetaminophen	Pain reliever	.050
Caffeine	Stimulant	.050
1,7-Dimethylxanthine	Caffeine metabolite	.050
Cotinine	Nicotine metabolite	.050
Sulfamethazine	Antibiotic	.025
Sulfamethoxazole	Antibiotic	.025
Trimethoprim	Antibiotic	.010
Lincomycin	Antibiotic	.010
Tylosin	Antibiotic	.010

APCI / ESI - Target Compounds

Compound	Application	RL (ug/L)
Bisphenol A	Plasticizer	0.050
Mestranol	Ovulation Inhibitor	0.050
Estrone	Reproductive Hormone	0.050
17 b-Estradiol	Reproductive Hormone	0.050
Estriol	Reproductive Hormone	0.050
cis-Androterone	Urinary Steroid	0.050
17a-Ethynyl Estradiol	Ovulation Inhibitor	0.050
19-Norethisterone	Ovulation Inhibitor	0.050

How Much is One Part Per Trillion

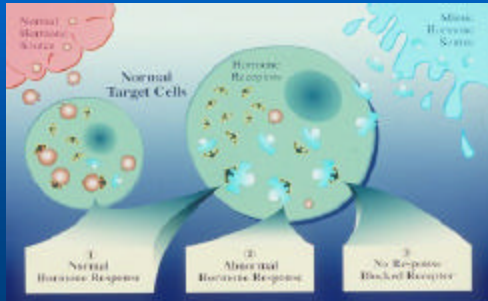
- ⚡ One drop of water in 660 rail tank cars. That's a train six miles long!
- ⚡ Dissolve one grain of salt in 1247 bath tubs full of water(44,893 gals), that's like taking a shower for 12.5 days!

Why Do We Care?

- ⚡ Pathogen resistance to antibiotics
 - Over prescribed & under used
 - Human and Veterinary (biosolids)
- ⚡ Endocrine system disruption
 - Macho Mosquito Fish
 - Vitellogenin
 - Wombmate studies



Nutshell Endocrinology



Project Goals

- ⚡ Regional targeted screening
 - WWTP's & effluent dominated waters
- ⚡ Develop the analytical capabilities
- ⚡ Synoptic look at what is going into our waters.....first step
- ⚡ Next steps?

How Are We Doing It?

- ⚡ Clean hands, grab or composite sampling
- ⚡ Sampling being conducted by State agencies
 - Maine: 19 locations
 - Vermont: 12 Locations
 - New Hampshire: 2 samples, 1 location
 - Connecticut: 12 locations?

FOR MORE INFO...

<http://www.epa.gov/esd/chemistry/pharma>