May 2nd, 10:30 AM - 12:00 PM

What Goes Down the Drain Eventually Reaches the River: Characterizing Contaminants of Emerging Concern (CECs) in the Columbia River Basin

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WHAT GOES DOWN THE DRAIN EVENTUALLY REACHES THE RIVER: CHARACTERIZING CONTAMINANTS OF EMERGING CONCERN IN THE COLUMBIA RIVER BASIN

Jennifer Morace, USGS Oregon Water Science Center
First Steps...

- Targeted at known knowledge gaps
- Characterize important pathways of contaminant transport to Columbia River
- Begin to offer information on a broad suite of toxics that will help water managers and policy makers make informed decisions

http://www.epa.gov/columbiariver
Columbia River Inputs Study

- Characterize pathways contributing directly to the Columbia River
  - WWTP effluent
  - Stormwater runoff
Contaminants analyzed in WWTP effluent

- Pharmaceuticals
- Anthropogenic-indicator compounds
- Organochlorine compounds
- PCBs
- PBDEs
- Mercury
- Currently used pesticides
- Estrogenicity
Contaminants measured in WWTP effluents

Percent of compounds detected

- Plasticizers: 4/4
- Steroids: 4/4
- Detergent metabolites: 7/8
- Pharmaceuticals: 50/59
- Personal care products: 12/15
- PAHs: 8/9
- Flame retardants: 14/17
- Miscellaneous: 14/17
- PCBs: 9/18
- Pesticides: 27/104
- Overall: 149/255

Source: USGS
## Percent of detection at each WWTP sampled

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<th>Total # analyzed</th>
<th>Wenatchee</th>
<th>Richland</th>
<th>Umatilla</th>
<th>The Dalles</th>
<th>Hood River</th>
<th>Vancouver</th>
<th>Portland (am)</th>
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<th>Portland (pm)</th>
<th>St. Helens</th>
<th>Longview</th>
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</table>
Pharmaceuticals found at all WWTPs

- Iminostilbene – 0.4
- Citalopram (Celexa, Cipramil) – 0.5
- Diltiazem – 0.4
- Lidocaine – 0.4
- Methocarbamol (Robaxin) – 13
- Phenobarbital – 0.2
- Tramadol (Ultram) – 0.4
- Carbamazepine – 0.12
- Phenytoin (Dilantin) – 0.6
- Diphenhydramine (Benadryl, Motrin PM, ...) – 0.11

Any use of trade, product, or firm names is for descriptive purposes only and does not imply endorsement by the U.S. Government.
Diphenhydramine

- **Antihistamine**
- **Uses**
  - Relieves allergy and cold symptoms
  - Prevents and treats motion sickness
  - Treats insomnia
  - Controls abnormal movements (Parkinson’s syndrome)
- **Products**
  - 89 different brand names
  - 112 brand names for combination medications

Any use of trade, product, or firm names is for descriptive purposes only and does not imply endorsement by the U.S. Government.
Loadings to the Columbia

- Diphenhydramine in Portland
  - 49 mgd from WWTP
  - Average concentration of 0.064 µg/L
  - 10 g/day of diphenhydramine
  - 1 tablet = 25 mg
  - 400 tablets/day (16 boxes)

- Could lead to Columbia concentration of 0.001 µg/L

Idea of “pseudo-persistence”
Lessons learned

- The actions of society have an effect on the ecosystem.
- What goes down the drain reaches the river and the biota that rely on it. Not everything is cleaned up by the WWTP.
- Most stormwater is not treated.
Columbia River Contaminants and Habitat Characterization

http://www.youtube.com/watch?v=S2RRIbPIGHg

EDCs and PBDEs
Foodweb Sampling Design

Passive samplers
- contaminant analyses
- estrogen screen

Largescale Suckers
- contaminant analyses
- biomarkers

Sediments
- contaminant analyses
- sediment transport modeling

Invertebrates
- contaminant analyses
- community assessment

Osprey
- contaminant analyses
- productivity assessment
- well bird blood analyses
Biomagnification in the food web

Biomagnification in the food web (BDE100)

Largescale sucker

BMF=8

Osprey

BMF=122

BSAF=30

Macroinvertebrates

Sediment

Science of the Total Environment, v. 484, pp. 319-389

Special Section: Foodweb Transfer, Sediment Transport, and Biological Effects of Emerging and Legacy Organic Contaminants in the Lower Columbia River, Oregon and Washington, USA

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Questions?

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jlmorace@usgs.gov
503.251.3229

Jack Ohman, The Oregonian, May 2007

THE VIAGRA IN THE WATER MAKES ME WANT TO SWIM UPSTREAM, BUT THE PROZAC IS MAKING ME TOO TIRED.