Contaminants of emerging concern in bay mussels throughout the Salish Sea

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Contaminants of Emerging Concern in Bay Mussels throughout the Salish Sea

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Mussel Tissue Screening for Contaminants of Emerging Concern

Objectives to monitoring activities:

• characterize exposures to marine organisms in the nearshore environment

• highlight those which are present and have potential to cause environmental risk
Bay Mussel Sampling

Caged mussels transplanted from a single aquaculture source

Deployed for 2-3 months over winter
- 2013 for targeted
- 2016 non-targeted

Processed and stored at -20°C until analysis

Targeted Analysis
- Pharmaceuticals and Personal Care Products (~140 compounds)
- Nonyl- and octyl-phenols
- Pesticides
- Perfluorinated compounds

Non-Targeted Analysis
- High Resolution Mass Spectrometry
Oxycodone
(oPIOid pain medication)

- 90% is metabolized in humans
- Some removal through WWTP
- Measured in WWTP effluent
- No reports in Puget Sound water

- May be metabolized by fish
  (likely not mussels)
- May be bioactive in fish
  (fish have opioid receptor pathways)
Carcinogen due to DNA interactions

Potential EDC
Shown to induce heritable deletions and mutations in male germ cells (mice)

Melphalan (chemotherapy drug)
Virginiamycin (antibiotic)

Feed-additive for growth promotion in swine, turkey, and broiler chickens.

Produced by *Streptomyces virginiae*
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Non-Targeted Analysis
- High Resolution Mass Spectrometry
High resolution mass spectrometry

Abundant

Absent
Mussel Tissue Screening

Drospirenone

- CPS_SB (Salmon Bay)
- EB-ME (Elliot Bay)
- HC_FP (Hood Canal)
- RSMP006 (Eagle Harbor)
- RSMP017 (Budd Inlet)

used in birth control and hormone replacement therapy
WDFW Mussel Tissue Screening

17α-Hydroxyprogesterone

endogenous progestogen metabolite

<table>
<thead>
<tr>
<th>Location</th>
<th>Levels</th>
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Mussel Tissue Screening

- Evidence that organisms in the nearshore are being exposed to a wide range of compounds,

- Levels will probably not sufficient for toxicity, though do likely affect reproduction and health
**Perfluorinated Compounds**

Analyzed for 13 different compounds – result was a single detection of PFOSA (<1 ng/g wet weight)

80% of juvenile chinook had PFOS at ~10 ng/g

Lack of accumulation of perfluorinated compounds in mussels may be due to MXR transporter protein expression

Fernández-Sanjuan et al (2013)
Other compounds

4-nonylphenol
   Breakdown product of surfactant - exposure probably widespread through Salish Sea

Sertraline
   SSRI

Iopamidiol
   Contrasting agent. Seem to persist and be present throughout

Amitriptyline
   Antidepressant. May bioaccumulate.