Emerging Contaminants & Aquatic Impacts in San Francisco Bay

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Goal: Collect data, communicate information about water quality to support management decisions

Innovative Partnership
Celebrating our 25th year!
Nonylphenol & Nonylphenol Ethoxylates: Environmental Detections

SF Bay 2009-2010
Klosterhaus et al. 2013

Puget Sound 2013-2014
Meador et al. 2016

Effluent

4-NP: 506-1690 ng/L
4-NP1EO: 1220-1760 ng/L
4-NP2EO: 1690-2610 ng/L

Water

4-NP: ND - 73 ng/L
4-NP: 41 ng/L

Sediment

4-NP: 22-86 ng/g dw
4-NP1EO: 4-40 ng/g dw
4-NP2EO: ND-19 ng/g dw

DATA GAP:
Other Members of NPE Family
Nonylphenol & Nonylphenol Ethoxylates: Additional Hazard Traits

• **Sensitive species:**
  Barnacle *Balanus amphitrite*
  Reduced larval settlement: 60 ng/L NP  
  Billinghurst et al. 1998

• **Synergistic impacts:**
  Estrogenicity (in vivo) – APs/APEs and pesticides (bifenthrin, diuron)  
  Schlenk et al. 2012

Moderate Concern for San Francisco Bay
Nonylphenol & Nonylphenol Ethoxylates: Consumer Product Sources

- Polyethylene (food-grade) – Hamlin et al. 2015
- Plastic (as aquatic contaminant)
  - Hirai et al. 2011: Plastic from North Pacific Central Gyre contains NP (6-1000 ng/g ww), likely additive
  - Gassel et al. 2013: Plastic-mediated exposure to NP linked to fish from this Gyre
Nonylphenol & Nonylphenol Ethoxylates: Consumer Product Sources

EPA Proposes Significant New Use Rule
October 1, 2014

Detergent
Cleaning surfactant
Coatings
Paints
Resins
Sealants
Adhesives
Caulk
Printing ribbon component
Food additive
Food contact adhesives and coatings
Pesticide ingredient
Agriculture use for animals
Fuel additive
Plastic and polymer additive

Hardener
Lubricant
Colorant or ink component
Emulsifier
Epoxy catalyst
Rheology modifier
Wetting agent
Catalyst
Processing aid
Defoamer
Antioxidant
Corrosion inhibitor
Paint stripper
Paint primer
...
Triclosan:
Recent Environmental Detections in SF Bay

Effluent
- **JUL 2011:** 313 ± 72 ng/L  
  Hensley et al. 2015  
  Palo Alto Regional Water Quality Control Plant  
  n = 4 each
- **JAN 2012:** 58 ± 4 ng/L

Water
- **Lower South Bay:** 68 ± 26 ng/L  
  Kerrigan et al. 2015
- **Sacramento River:** 17 ± 9 ng/L

Sediment
- Up to 40 ng/g dw  
  RMP unpublished data, 2008  
  Kerrigan et al. 2015
Triclosan

Central Bay Sediment Core

South Bay Sediment Core

produced in the 1960’s

Kerrigan et al. 2015
Triclosan:
Key Data Gaps

Methyl Triclosan

Identified in SF Bay mussels via non-targeted analysis

Special Study 2017: Triclosan and Methyl Triclosan in Small Fish
Other Chemicals of Concern: Phosphate Flame Retardants

- Chlorinated phosphates

- Triphenyl phosphate
  - Plastic component
  - Persistence and ecotoxicity
  - Levels in SF Bay near PNEC
  - Additional monitoring in 2017
Future Monitoring Priorities

• Bisphenols – 2017 ✓
• Brominated azo dyes
• Poly- and perfluorinated substances
• Quaternary ammonium compounds
• Synthetic musk fragrance ingredients
• Non-targeted analysis ✓
References


