

## Three Marine Superfund Sites

Polymeric Sampling Devices and Semipermeable Membrane Devices (SPMD) - Polyethylene (PE), Polydimethylsiloxane (PDMS), Polyoxymethylene (POM), and SPMD

### Summary

<b>Media:</b>	Water column
<b>Study Type:</b>	In situ
<b>Technology:</b>	PE, PDMS, POM (equilibration), and SPMD (accumulation)
<b>Peer Reviewed:</b>	Yes
<b>Publication Date:</b>	August 2015

### Study Description

- The objective was to compare the performance of different types of passive samplers for measuring water column freely-dissolved concentrations ( $C_{free}$ ) of target contaminants, including PCBs, PAHs, and PBDEs, at three Superfund sites, including New Bedford Harbor (NBH; New Bedford, MA, USA), Palos Verdes Shelf (PVS; Los Angeles, CA, USA), and Naval Station Newport (NSN; Newport, RI, USA).
- The passive samplers investigated included polyethylene (PE), polydimethylsiloxane (PDMS)-coated solid-phase microextraction fibers (SPME), semipermeable membrane devices (SPMD), and polyoxymethylene (POM).
- SPMDs were composed of 91.4-cm-long, 2.5-cm-wide, flat, hollow, low-density PE ribbons (70–95 mm thick) containing 1 mL pure (99%), high-molecular weight lipid glyceryl trioleate (triolein) in a thin film.
- Deployment time varied from 21 days to 5 months.
- PE-based  $C_{free}$  was adjusted for disequilibrium using performance reference compounds (PRCs). Equilibrium was assumed for PDMS. PRCs data for POM and SPMD were problematic and could not be used to adjust disequilibrium.

### Remedial Phase

Not applicable. Sampler comparison.

### Outcome

The different passive samplers used in the study showed good agreement in measuring  $C_{free}$  of target contaminants, with values varying by a factor of 2 to 3. At NBH, passive sampler-based  $C_{free}$  values agreed within a factor of 2 compared to the conventional water column grab samples. A strong correlative and predictive relationship was found between PE passive sampler accumulation and lipid-normalized blue mussel bioaccumulation of PCBs at NBH. The study demonstrates the practical utility of passive sampling for generating scientifically accurate water column  $C_{free}$ , and passive sampling could be considered a surrogate for biomonitoring organisms.

### Case Study Reference

Burgess, Robert M., Rainer Lohmann, Joseph P. Schubauer-Berigan, Pamela Reitsma, Monique M. Perron, Lisa Lefkovitz, and Mark G. Cantwell. 2015. Application of Passive Sampling for Measuring Dissolved Concentrations of Organic Contaminants in the Water Column at Three Marine Superfund Sites. *Environmental Toxicology and Chemistry* 34(8): 1720–33. <https://doi.org/10.1002/etc.2995>