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Six years of monitoring PCBs and PAHs by passive sampling in parallel with deployed mussels

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Monitoring

Since 1991 RIKZ maintains a mussel watch program to monitor compounds that can not be determined in water with classical sampling and analyses[1]. Mussels are deployed at 8 stations in autumn and winter (Fig. 1). From 2001 passive samplers made from silicone rubber were deployed in parallel.

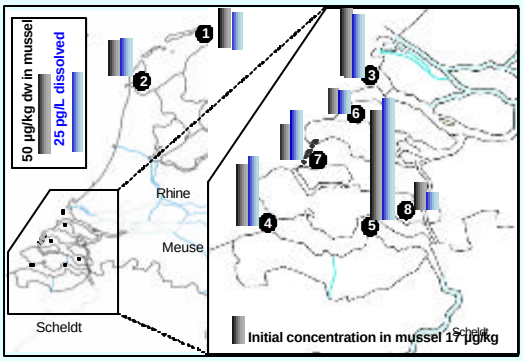


Fig 1. Monitorings stations and geographical distribution of CB153 in mussel and water

Method

- Mussels of 5 cm collected
- Placed in frame with passive sampler (Fig. 2)
- 100 mussels per station.
- Silicone rubber A=400cm; d=0.5 mm.
- Pre-extracted.
- Spiked with 4-10 PRCs[3]
- Deployment for 6 weeks.
- Soxhlet extraction and cleanup.
- PCB with GC-ECD.
- PAH with HPLC-Fluorescence.
- Sampling rate from PRCs → Correction for local and temporal flow variations.
- Calculate C in water – pg/l (K_{SW})[4].
  C in mussels µg/kg.
  BAF mussel-water.

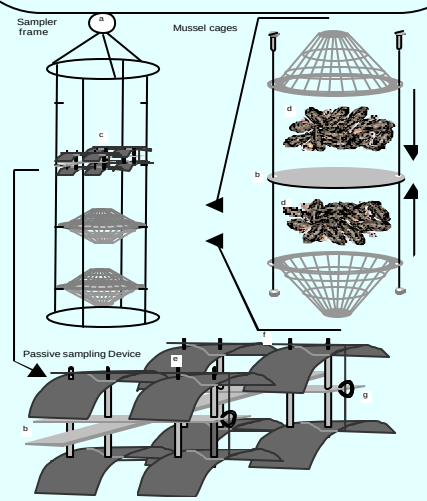


Fig 2. Construction of frame with mussels and passive samplers

Principle of PS

Hydrophobic compounds in organisms are mainly accumulated in the body lipid. Passive sampling mimics the body lipid and when deployed will passively accumulate dissolved compounds. The higher concentration in the water the higher the uptake[2].

Passive samplers:

- do not metabolise;
- toxic conditions - no mortality;
- have no start concentration;
- apply to all salinities;
- no geographical limitations;
- uptake varies with flow conditions

Fig 3.

Concentration in time

Left: Pyrene in mussel (µg/kg) over time for all stations.

Right: Dissolved Pyrene (pg/l) from passive sampling

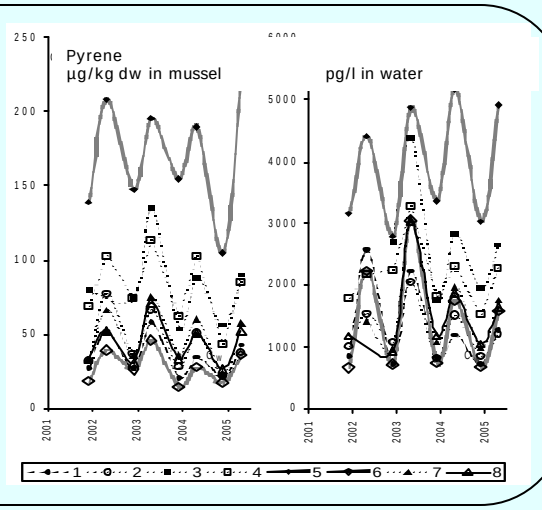
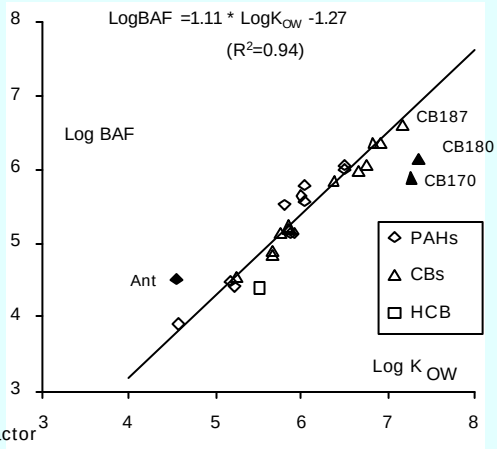


Fig 4.

BAF versus K_{ow}

Outliers:
Ant → analytical;
CB170 and CB180 → ?;
HCB → other compound



BAF=Bio accumulation factor

Conclusions:

- close relations of passive sampling with mussel results confirms the environmental relevance;
- passive sampling and mussels often follows the same seasonal variation (Fig.3);
- in spite of the different uptake mechanisms concentrations in mussel can be predicted from passive sampling results through BAF (Fig.4);
- passive sampling may be preferred over mussel watch??

Referenses:

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