

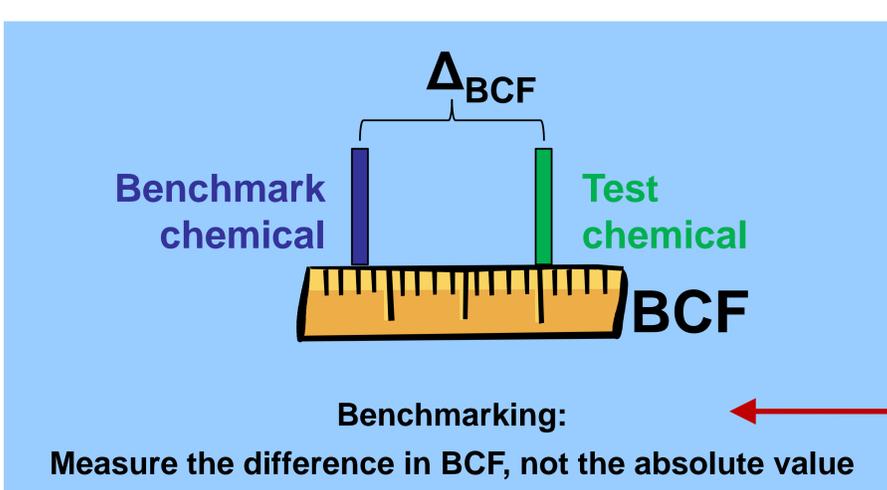
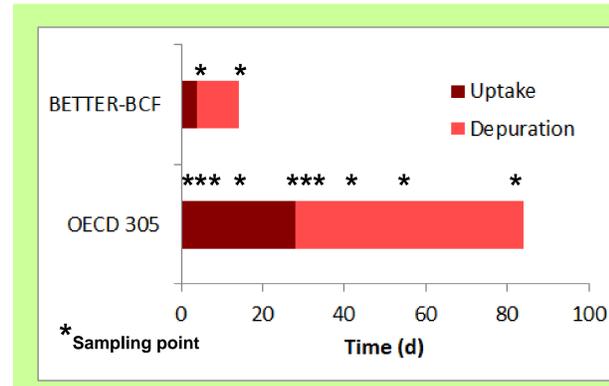
Michael S. McLachlan, Margaretha Adolfsson-Erici, Gun Åkerman, Annika Jahnke, Philipp Mayer
Department of Applied Environmental Science (ITM), Stockholm University, Stockholm, Sweden
Department of Environmental Science, Aarhus University, Roskilde, Denmark

Introduction

OECD 305 is the standard test protocol to assess bioaccumulation under REACH. There are concerns about the costs of this test in terms of laboratory animals, time, and money.

We developed a new protocol dubbed BETTER-BCF to address these concerns by:

- Using passive dosing to maintain constant freely dissolved concentrations during exposure
- Using in-tissue passive sampling in the fish to measure depuration kinetics
- Reducing the length of the exposure phase and the depuration phase
- Reducing the number of sampling time points
- Conducting the test for multiple chemicals simultaneously
- Employing benchmarking chemicals as method-internal standards



Test Chemicals (exposed simultaneously)

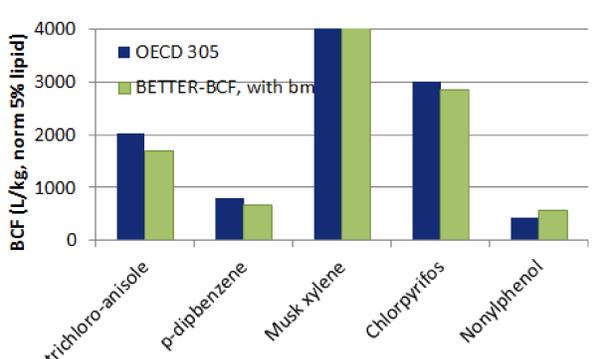
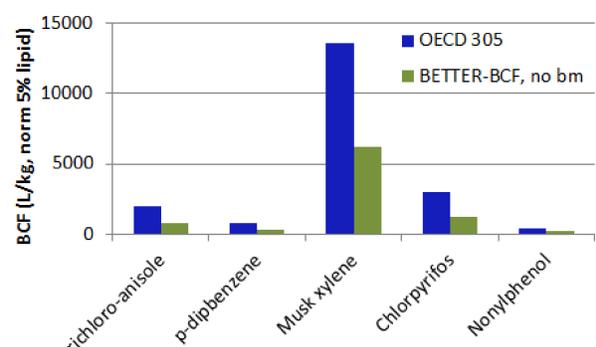
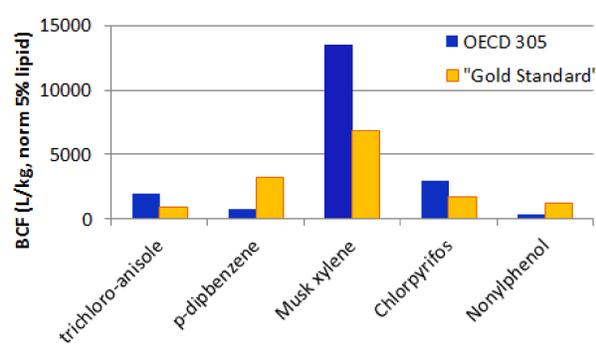
	log K _{OW}	BCF (literature) (L kg ⁻¹)
2,3,4-trichloroanisole	3.95	920
p-diisopropylbenzene	4.9	3200
musk xylene	4.9	6810
chlorpyrifos	4.77	1750
4-n-nonylphenol	6.19	1200
2,4,6-tri-tert-butylphenol	6.55	20000
pentachlorobenzene	4.6	5700
2,5-dichlorobiphenyl		
hexachlorobenzene	5.7	27000
p,p'-DDT	6.9	25000

Methods

- Run OECD 305 with rainbow trout for all 10 chemicals simultaneously
- Run BETTER-BCF protocol in parallel

Results

- BCF for 5 chemicals governed by growth dilution, hence BCFs not comparable between studies
- Poor agreement between BCFs from OECD 305 experiment and "gold standard" values from the literature (top panel)
- Poor agreement between BCFs from OECD 305 experiment and BETTER-BCF experiment when no benchmarking used (middle panel)
- Excellent agreement between BCFs from OECD 305 experiment and BETTER-BCF experiment when benchmarking used (lower panel)



Conclusions

- The time for the OECD 305 test can be reduced from 12 to 2 weeks
- The number of fish can be reduced from 40 to 8
- Improvement are made possible by the use of benchmarking
- Benchmarking can enhance inter-laboratory and inter-test comparability of measured BCFs
- It is possible to test several chemicals simultaneously
- Due to growth dilution, the OECD 305 method cannot quantify BCF values > ~20,000

Acknowledgements

- Funding was provided by the European Chemical Industry Council Long-Range Research Initiative