Challenges with aquatic ecotoxicology testing and analytical confirmation of poorly water soluble UVCBs

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ABSTRACT

Ecotoxicity testing with unknown/variable composition, complex reaction products and biological materials (UVCBs) presents unique challenges due to the differing physiochemical properties of the individual components, including water solubility. For UVCBs that are only partially soluble in water, OECD Guideline 23 recommends preparation of individual water-accommodated fractions (WAF). However, experience has shown that for some UVCBs the amount of the components in solution can be relatively consistent regardless of the loading rate and yield a flat dose response among an array of concentrations. Because of this, selecting a range of loading rates to produce an adequate dose response for UVCBs with slight to moderate toxicity, while maintaining appropriate dilution factors, is nearly impossible.

METHODS

- *Daphnia magna* exposure
  - Four individual WAF solutions, analytical confirmation of concentrations
  - Nominal loading rates spanning 0.10 to 100 mg/L
- *Raphidocelis subcapitata* exposure
  - Five individual WAF solutions, no analytical confirmation
  - Nominal loading rates spanning 0.20 to 100 mg/L

RESULTS

- Despite preparing WAFs with loading rates spanning over four orders of magnitude, the measured concentrations remained within a factor of three
- After 72 hours of exposure, percent reductions in density (compared to the control) ranged from 11 to 18%, suggesting that the actual exposure concentrations were nearly identical

Preparing serial dilutions from a single WAF stock may be a more appropriate option for some UVCBs

Daphnia magna Exposure Concentrations			
Nominal Loading Rate (mg/L)	Measured Concentration (mg/L)		
	Analyte 1	Analyte 2	Analyte 3
0.10	0.056	0.011	0.044
1.0	0.067	0.013	0.049
10	0.081	0.014	0.084
100	0.11	0.027	0.13

Table 1: Measured concentrations of the three major analytes in fortified laboratory well water

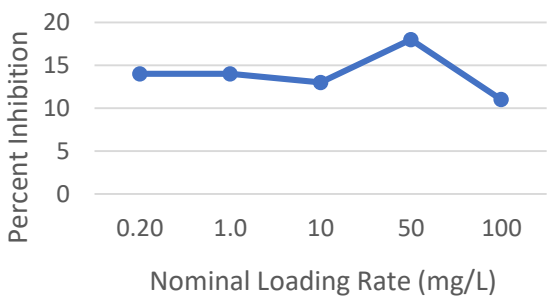

Figure 1: Percent inhibition (compared to the control) of *R. subcapitata* after 72 hours of exposure

CONCLUSIONS

Because the dose response produced from the *R. subcapitata* exposure was so shallow, the data could not be adequately plotted in order to generate reliable ECx values. Additionally, measuring out a mass of the UVCB below a loading rate of 1.0 mg/L is impractical due to either the very small mass to weigh or the very large volume of water needed. Therefore, preparing serial dilutions from a single WAF stock may be a more appropriate option for some UVCBs.

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