Chronic and acute ecotoxicological effects of Tetrabromobisphenol-A on the microalgae *Raphidocelis subcapitata*

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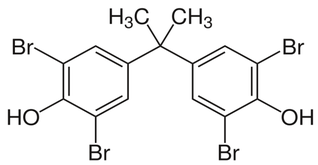
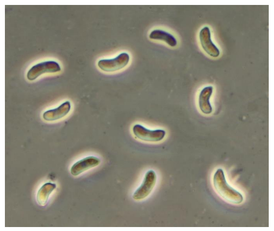
Emerging pollutants in aquatic ecosystems

INTRODUCTION

Flame retardants are compounds incorporated into plastics, textiles, and electrical/electronic products to prevent or delay fire spread. Tetrabromobisphenol-A (TBBPA) is a widely used brominated flame retardant and has already been identified in several environmental compartments. Studies have shown possible food web biomagnification of TBBPA, which is of concern since TBBPA is considered an endocrine disruptor. In this study, the potential effects of TBBPA on the base of the food web were evaluated by using the microalgae *Raphidocelis subcapitata* as a test organism.



TBBPA



R. subcapitata

METHODS

TBBPA concentration of 0.01 µg/L, 0.05 µg/L, 0.5 µg/L, and 5 µg/

Cultivation of the microalgae in quintuplicates

Absorbance reads at 680 nm

$$\frac{Ln(Y_i)}{Ln(Y_0)} = A\, e^{-e^{\frac{\mu max\, e}{A}(\lambda - t)+1}}$$

Modified Gompertz Equation

$$GR = \frac{\sum_{i=0}^{t} \frac{Ln(Y_i)}{Ln(Y_0)}}{t}$$

Growth rate

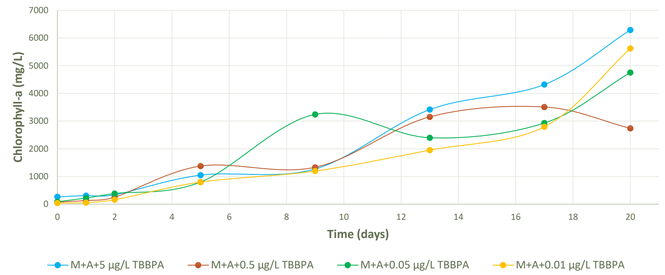
Chlorophyll-a (Chl-a) extraction every 3 days

Exposure period:
Acute assays: 60 hours
Chronic assays: 20 days

RESULTS

Chl-a on day 2 for TBBPA at 5 µg/L

Chl-a on day 20 for TBBPA at 5 µg/L



Chlorophyll-a concentration versus exposure time on the chronic assays

Ecotoxicological parameters for the chronic assay

TBBPA (µg/L)	Maximum cell density (cel/mL)	Growth velocity (day^{-1})	Lag-time (day)	Chl-a (µg/L)
5	3.609	0.359	-0.66	2158.95
0.5	3.264	0.395	0.02	1570.65
0.05	3.318	0.404	-0.73	1851.85
0.01	3.133	0.345	-0.81	1579.9
Control	3.279	0.367	-0.68	824.69

- TBPPA induced a greater effect in Chl-a production than in cell density;
- In the chronic assays, it was observed an increase between 2.0 and 2.6-fold in Chl-a production per microalgae cell;
- In the acute assays, a similar effect was observed only for concentrations higher than 0.05 µg/L of TBBPA.

CONCLUSIONS

This study demonstrated that although TBBPA had no effects on the growth rate of the *R. subcapitata* at environmentally relevant concentrations, it induced the production of chlorophyll-a and cell multiplication, which can unbalance food webs. Further studies should investigate the effects of TBPPA on the photosynthesis-related and defense genes against toxicity of microalgae, as well as the potential biomagnification of this emerging pollutant on food webs.

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