Impact of contaminants on the spatial distribution of aquatic species in a non-forced heterogeneous exposure scenario: An approach based on the spatial avoidance

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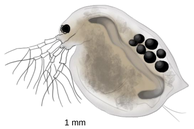
INTRODUCTION

Drugs and pesticides, such as irgarol (a pesticide), caffeine and the metal cadmium, are becoming pseudo-persistent contaminants that may have a biological impact on aquatic ecosystems [1]. The potential of them to affect the habitat selection by organisms (triggering avoidance or preventing colonization) was assessed using two freshwater species: the cladoceran *Daphnia magna* and the shrimp *Atyaephyra desmarestii*. For that, a novel non-forced exposure system (HeMHAS – Heterogeneous Multi-Habitat Assay System) was used to simulate heterogeneous contamination scenarios of the three contaminants, throughout which organisms could freely move.

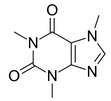
TEST ORGANISMS

The cladoceran *Daphnia magna*

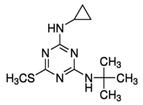


The *shrimp Atyaephyra desmarestii*

TEST SUBSTANCES



Caffeine



Irgarol

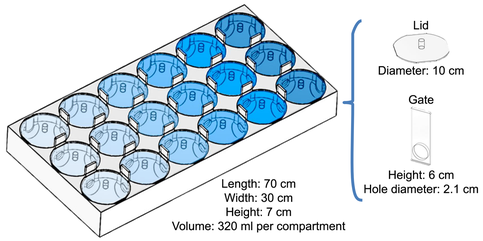
48
Cd
Cadmium
112.414

EXPOSURE AND ASSAY SYSTEM

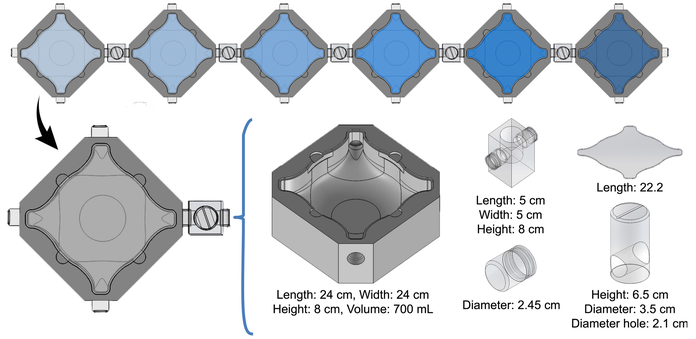
Contamination gradient: 0,01 to 100 µg/L (in logarithmic scale); **Exposure period**: 24 h; **Laboratory conditions**: starvation, 23ºC, darkness.

Number of organisms: 60 (10 per treatment) for *D. magna* and 30 (5 per treatment) for *A. desmarestii*; **Number of replicates**: 3

✓ Exposure system for *D. magna*



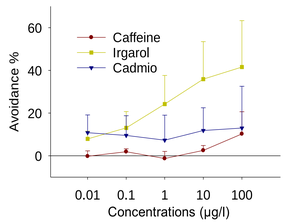
✓ Exposure system for *A. desmarestii*



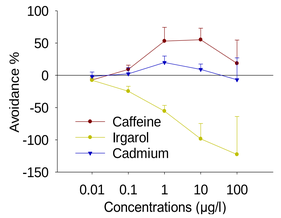
RESULTS

AVOIDANCE

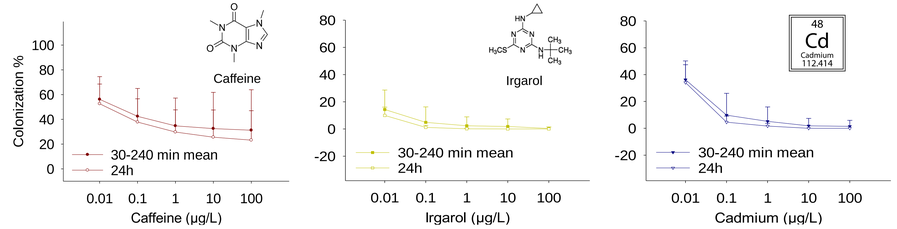
a) ***D. magna***

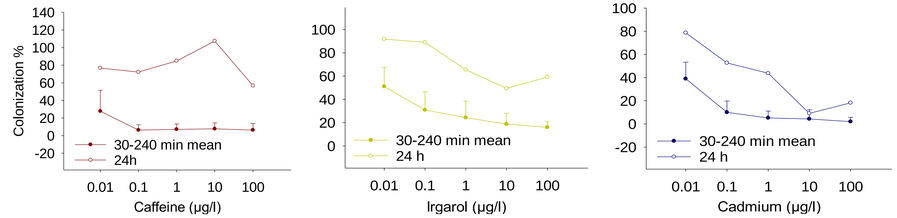


b) ***A. desmarestii***



COLONIZATION





EC_{50} values (for avoidance and colonization responses)

	(µg/L)	AC_{50} 24h	RC_{50} 4h	RC_{50} 24h
D. magna	caffeine	>100	<0.01	0.018
	irgarol	>100	<0.01	<0.01
	cadmium	>100	<0.01	<0.01

	(µg/L)	AC_{50} 24h	RC_{50} 4h	RC_{50} 24h
A. desmarestii	caffeine	>100	<0.01	<0.01
	irgarol	ND	<0.01	<0.01
	cadmium	>100	<0.01	<0.01

CONCLUSIONS

- *D. magna* was not able to avoid caffeine, but did do so with irgarol and cadmium. *A. desmaresti* detected all tested contaminants, avoiding caffeine and cadmium and was attracted to irgarol.
- For both organisms, the higher the concentration, the lower the colonization percentage for all contaminants, except for caffeine that attracted *A. desmarestii* after 24 h exposure.
- The same contaminant had distinct effects (regarding avoidance and repellence) on organisms belonging to different trophic levels, what could create imbalances in trophic webs of polluted habitats.

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REFERENCES

[1] Brönmark and Hansson (eds), 2012. Chemical Ecology in Aquatic Systems. Oxford.