Can life history influence the responses of the polychaete *Hediste diversicolor*?

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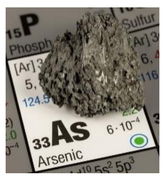
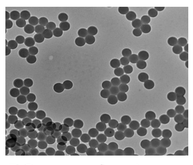
Objectives:

Assess the impact of arsenic on specimens of *Hediste diversicolor* never exposed to contaminants and pre-exposed to waterborne 100 nm polystyrene nanoplastics (PS NPs) in terms of behaviour, neurotransmission, energy metabolism, and oxidative status.

Introduction:

Hediste diversicolor





PS nanoplastics (100 nm)

Discharges of contaminants in aquatic systems have led to an increase in their concentration in sediments, that act as both sink and sources of contaminants [1]. Benthic organisms are thus at higher risk of exposure *via* pore water, sediments and feeding [2].

Previous studies have demonstrated that metals and metalloids, such as arsenic (As), accumulate in sediments in higher concentrations than in the water column and have been shown to affect polychaetes [3,4].

Plastic pollution has also become a significant problem, with debris reaching the ocean and becoming available to all organisms, since plastic break down into micro- and nanoparticles [5], along the water column and sediments. This debris may interact with other contaminants present in the natural environments, becoming vectors and thus affecting aquatic organisms through various pathways [5].

Methods:

Collection of organisms :

Specimens of *H. diversicolor* were collected in a reference site in Ria de Aveiro and acclimatized to laboratory conditions, after which they reproduced and grew.

Tested conditions:

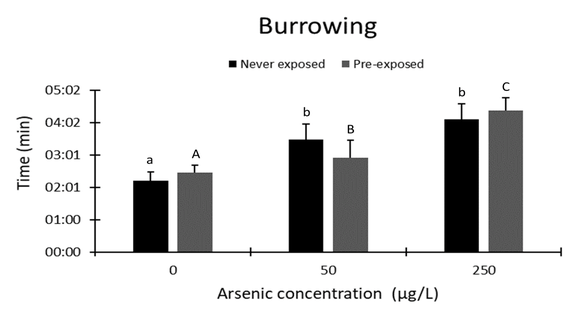
Some organisms were selected for chronic tests with PS NPs (5 µg/L).

Organisms previously exposed to PS NPs and organisms never exposed to contaminants were exposed to arsenic (0, 50, and 250 µg/L).

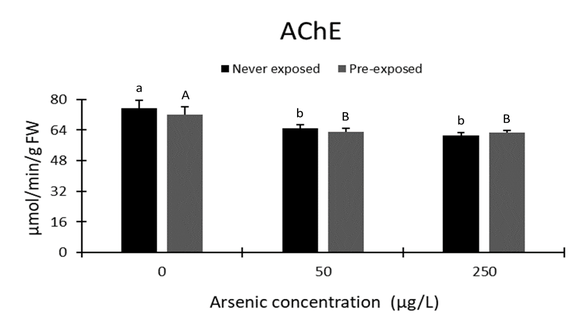
Responses of organisms :

Burrowing tests were performed [6] and biochemical endpoints associated with oxidative status were assessed.

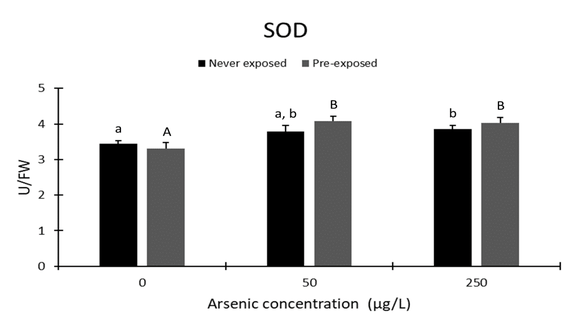
Results:



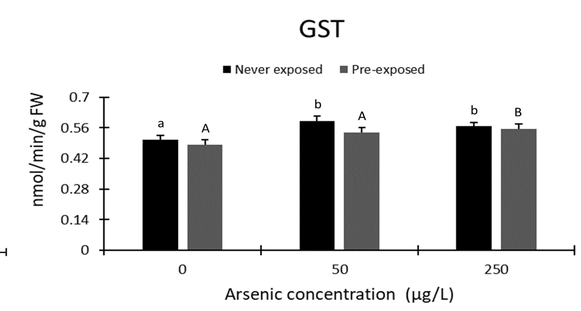
Burrowing activity increased for all exposed organisms.



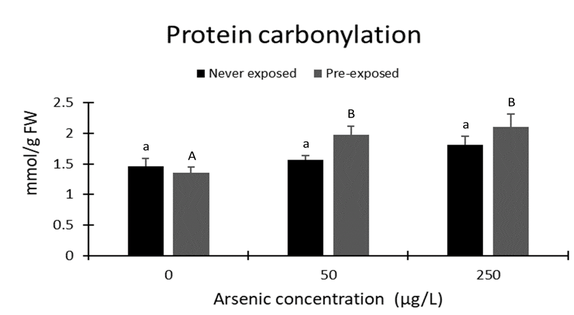
AChE decreased for all exposed organisms.



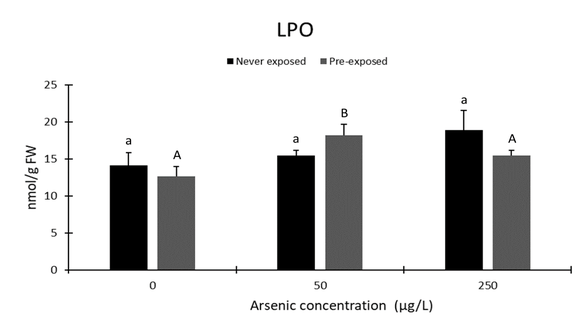
SOD was more affected in pre-exposed organisms.



GST was higher in never-exposed organisms.



Protein carbonylation was higher in pre-exposed organisms.



LPO was higher in pre-exposed organisms.

Conclusions:

The relevant data obtained in this study demonstrated severe consequences of As at the behavioural and biochemical levels, particularly to organisms that had been previously exposed to another contaminant, since oxidative damage was higher in *H. diversicolor* previously exposed to PS NPs. Alterations at the behavioural and biochemical levels may lead to severe consequences at the population level and possible repercussions on the ecosystems, since slower polychaetes may not promote proper sediment oxygenation.

Another important point to consider is that plastics absorb components from the surrounding environment, from organic matter to contaminants, making it of high importance to understand these interactions between plastics and other contaminants and its impacts on benthic organisms [5].

Acknowledgements:

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