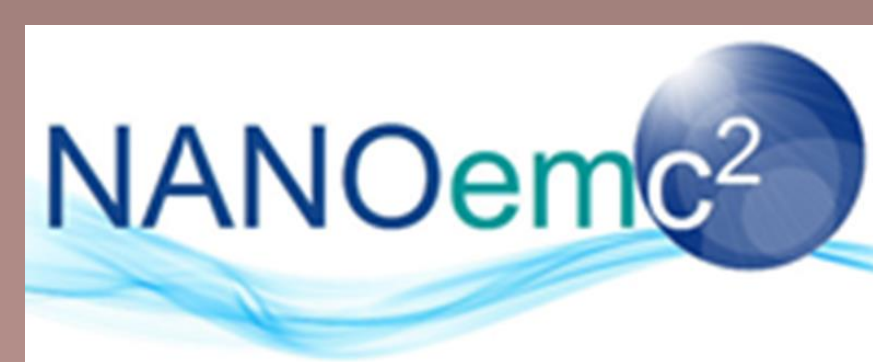




THE INFLUENCE OF POLYSTYRENE NANOPARTICLES ON BIOMARKERS OF EFFECT IN MUSSEL

Mytilus galloprovincialis



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Introduction

Entry of plastics into the environment represents a worldwide pollution problem and is exacerbated by their degradation into ever smaller particles, e.g. microplastics (>1 μm) and nano-sized particles (<100 nm), potentially becoming more bioavailable to organisms as well as a vector for other contaminants [1]. Ecologically and commercially important filter feeders such as mussels are increasingly being used as sentinels due to their habitat, feeding behaviour and probability of encountering plastic particles of varying sizes [2] which often overlap in size with natural particles of food. In this study, polystyrene nanoparticles' (PS NPs) influence on specific biomarkers of effect in Mediterranean mussel *Mytilus galloprovincialis* were investigated.

Materials and methods

PS NPs were synthesised from radical-initiated polymerisation of styrene and the particles size distribution and morphologically were characterised by scanning electron microscopy. Mussels were exposed to a range of PS NP concentrations (10, 50 and 100 mg/L) for 42 h, and the specific activity of enzymes acetylcholinesterase (AChE) and glutathione S-transferase (GST) in the gills and digestive gland were determined.

Results

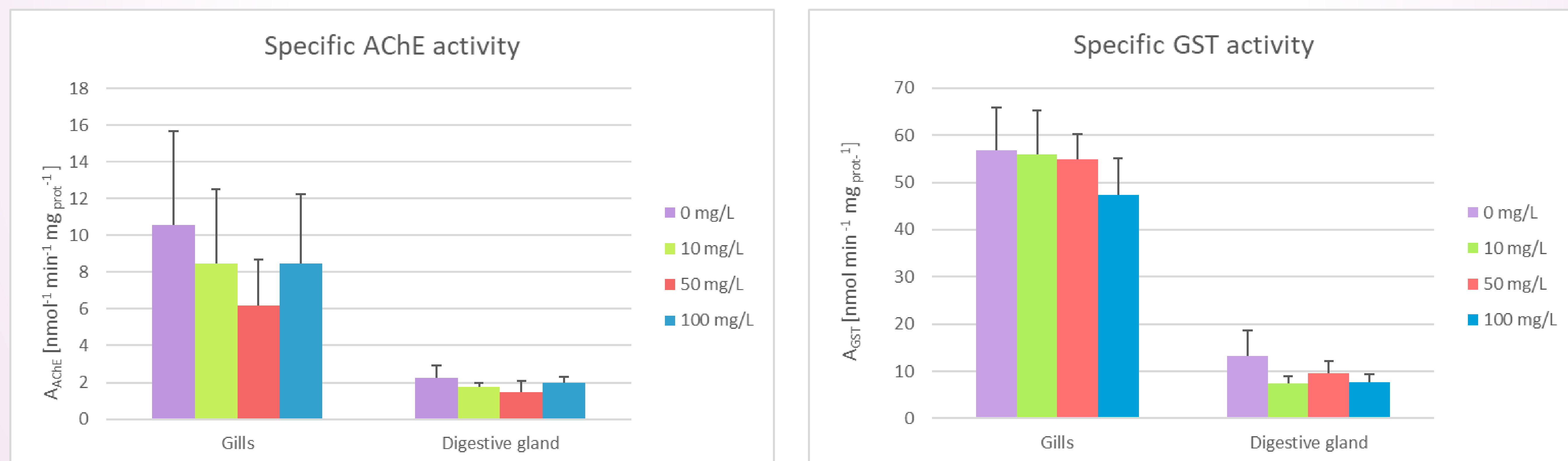


Figure 1. Specific acetylcholinesterase (AChE) and glutathione S-transferase (GST) activities (mean \pm standard deviation) in gills and digestive gland of mussels after exposure to varying PS NP concentrations.

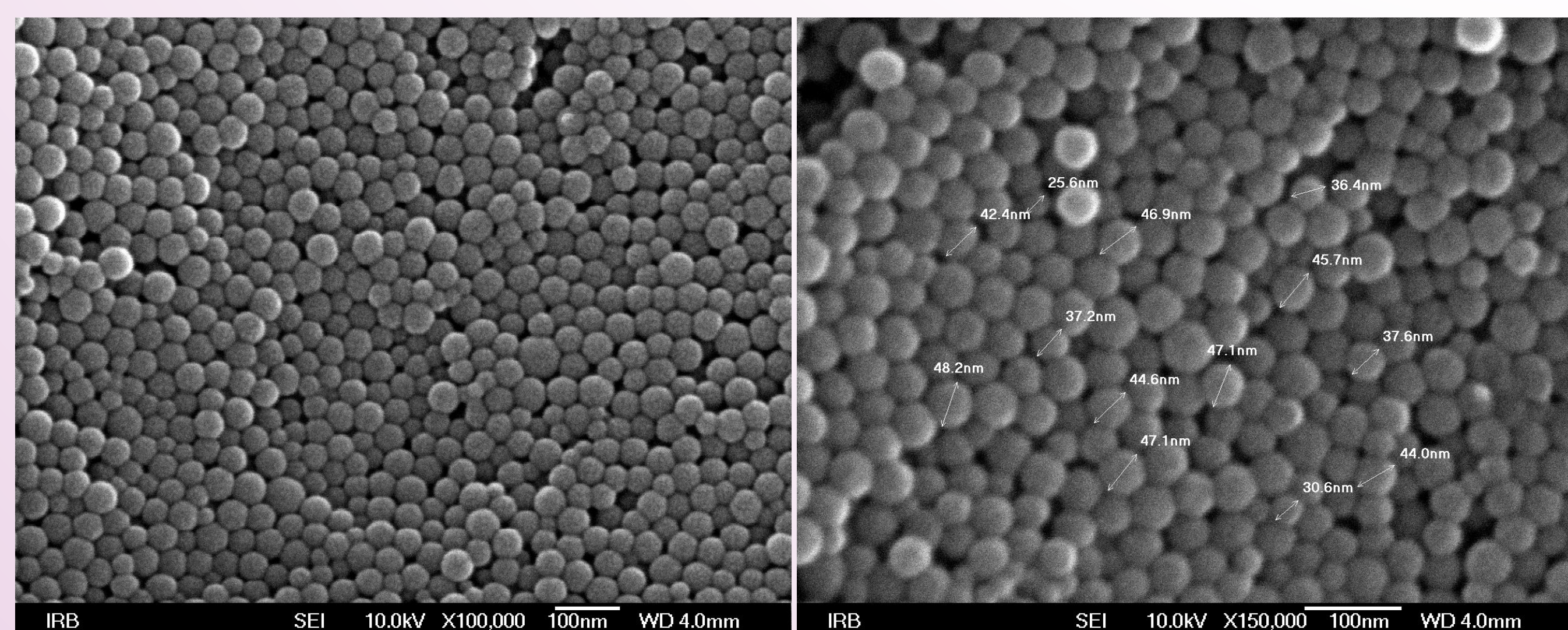


Figure 2. Scanning electron micrographs of synthesised PS NPs.

Conclusion

The PS NPs induced effects on neurotransmission in gills, measured as inhibition of AChE activity compared to the control. However, a significant change of GST activity in gills was only observed at the highest concentration, while activity reduction in the digestive gland was noted for all concentrations. Overall, it is shown that exposure of *M. galloprovincialis* to PS NPs increases oxidative stress by impacting the normal activity of enzymes. Ultimately, this work is a step in the direction to better understanding plastic nanoparticles' toxicity on commercially important shellfish and more broadly bioaccumulation in marine biota.

References

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- [2] M. S. Bank, *Microplastic in the Environment: Pattern and Process*, Springer, Switzerland, 2022, 225.

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