TU100

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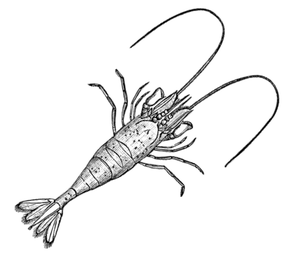
Blue mussel (*Mytilus edulis*)

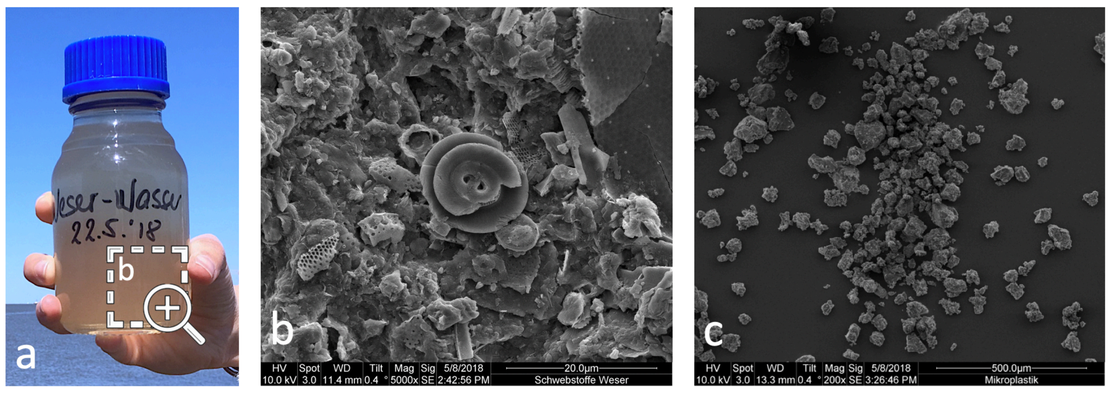
Cellular effects of natural and synthetic microparticles in marine invertebrates



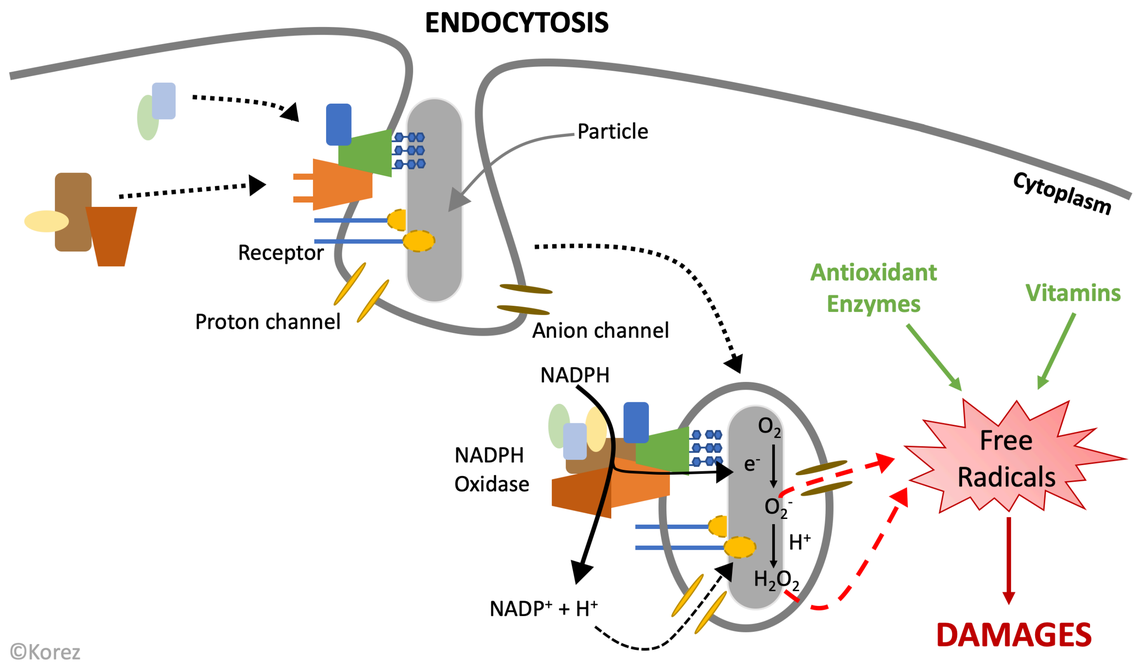
Brown shrimp (*Crangon crangon*)

Organisms are in their natural environment exposed to a variety of organic and inorganic particles. These are readily ingested along with their food. Since recently, they are also exposed to manmade microplastics that are accumulating in all marine habitats.

Smallest particles can enter the cells of the midgut gland where they can induce an oxidative stress response. Free oxygen radicals can damage biomolecules in the cells.



Water from the estuary of the Weser river (a) contains various organic and inorganic microparticles (b). The shape of these particles is similar to microplastics (c).



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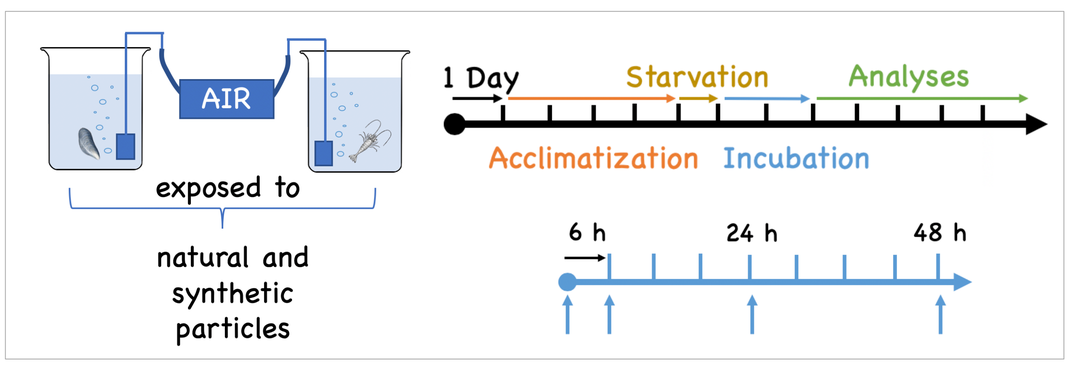
THE GOAL

Within this doctoral work cellular effects of oxidative stress induced by microparticles of anthropogenic and natural sources will be identified and distinguished. The results will help to understand and evaluate the hazard of microplastics to marine invertebrates and to define their actual threat boundaries.

METHODS

1. Freshly caught shrimps were dissected. Stomach contents were investigated by scanning electron microscopy.
2. Digestive glands were incubated in dihydroethidium to test for the formation of oxygen radicals due to stress (here: H_2O_2).

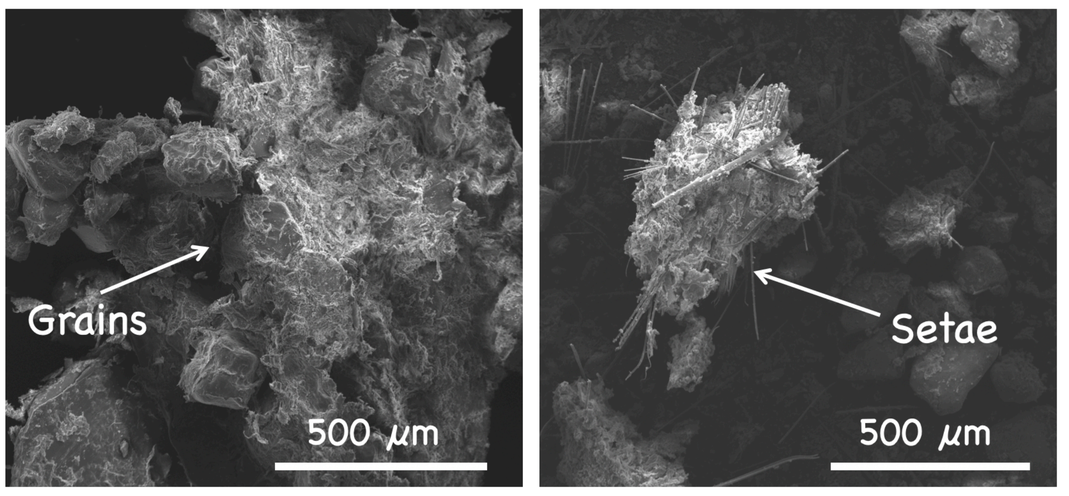
FUTURE WORK



Organisms will be separately incubated in suspensions of synthetic and natural particles for 6, 24 and 48 h, followed by biochemical analyses.

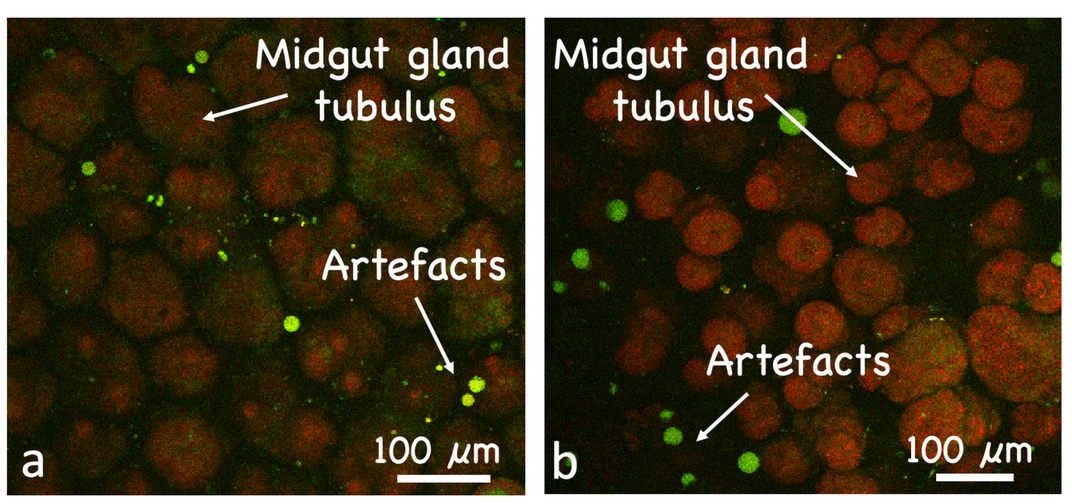
FIRST RESULTS

1. Brown shrimps and blue mussels ingest inorganic particles and microplastics in their natural habitats.



Shrimp stomach contains sediment grains (a) and prey remains (e.g. setae from polychaetes, scales from mussel) (b).

2. Stressed organisms (e.g. due to H_2O_2) produce more oxygen radicals, which is shown by stronger fluorescence than in controls.



Oxygen radicals in the digestive tissue of control shrimp (a) and shrimp exposed to H_2O_2 (b).

RELATED LITERATURE:

Devriese, L.I., van der Meulen, M.D., Maes, T., Bekaert, K., Paul-Pont, I., Frère, L., Robbens, J. and Vethaak, A.D., 2015. Microplastic contamination in brown shrimp (*Crangon crangon*, Linnaeus 1758) from coastal waters of the Southern North Sea and Channel area. Marine Pollution Bulletin 98(1-2), 179-187.

Kiørboe, T., Mølenberg, F. and Nøhr, O., 1980. Feeding, particle selection and carbon absorption in *Mytilus edulis* in different mixtures of algae and resuspended bottom material. Ophelia, 19(2), 193-205.

Needham, S.J., Worden, R.H. and Mcilroy, D., 2004. Animal-sediment interactions: the effect of ingestion and excretion by worms on mineralogy. Biogeosciences 1(2), 113-121.

Van Cauwenberghe, L. and Janssen, C.R., 2014. Microplastics in bivalves cultured for human consumption. Environmental Pollution 193, 65-70.

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