

## Histological effects of and cellular responses to microplastics in the gills of *Mytilus galloprovincialis*

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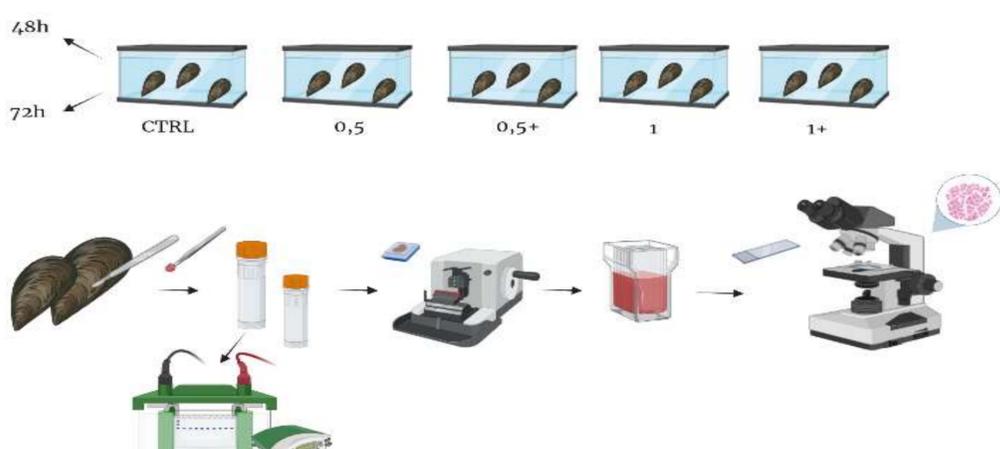
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### INTRODUCTION & AIM

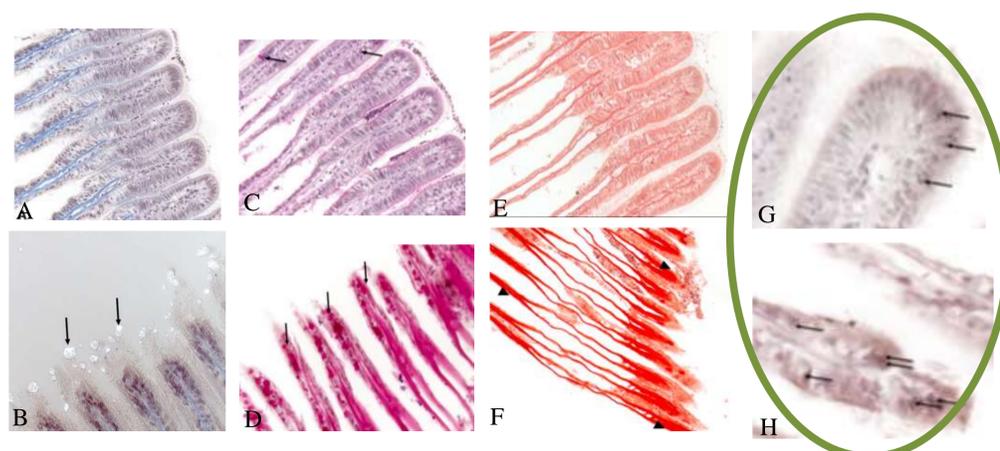
Nowadays, we are living in what is called *The Plastic Era*. Plastic undergoes fragmentation to form **microplastics (MPs)**, whose small size led to their accumulation at different trophic levels. Aquatic organisms ingest these particles; furthermore, MPs can bind other pollutants, facilitating their uptake into living organisms, acting as a *Trojan horse*. This study investigated the effects of polystyrene MPs in the gills of *Mytilus galloprovincialis*, a good bioindicator of the marine environment and widely exploited as food.

### METHOD

The animals were treated with 0.5 and 1 µg/mL of MPs (5 µm) alone and conjugated with Bisphenol A (BPA) 25 µM (0,5+ and 1+, respectively) for 48h and 72h. Then, gills were removed and used for morphological (Trichrome, Picro-Sirius Red and PAS stainings), Immunohistochemical and Western Blot investigations.



### RESULTS & DISCUSSION

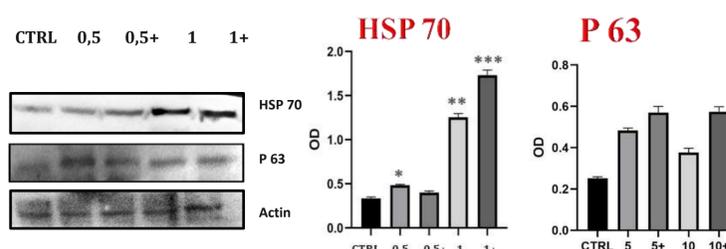


**Control gills.** **A:** well-organized and normal branchial epithelium; **C:** few muciparous cells (arrows) located in the outer part of the gill epithelium; **E:** presence of collagen in the normal range.

**Gills treated with MPs.** **B:** MPs (arrows) in the apical area of gills; **D:** increase in hypertrophic muciparous cells in the apical area (arrows); **E:** increase in collagen depots (arrowhead).

#### PCNA Gills immunohistochemistry:

**Control G:** signal is evident in a few cells (arrows). **Treated with MPs H:** Increased number of positive cells for PCNA



Densitometric analysis of **HSP70** and **P 63**; increased levels of HSP70 and p63 are indicative of a cellular response to stress.

### CONCLUSION

The presence of MPs in seawater induces in *M. galloprovincialis* gills alterations in morphology and function, regardless of MPs concentration, conjugation with BPA and exposure time. Increased levels of HSP70 and p63 demonstrates cellular stress; the increase in positive cells for the PCNA immunological signal demonstrates cell proliferation. Analysis of the functionality of the antioxidant machinery shows the occurrence of cellular stress conditions, not linked to BPA conjugation, but greater with the highest MPs concentration tested. In conclusion, the results clearly demonstrate the stressogenic effect of MPs, whereas the *Trojan horse effect* for BPA does not seem to occur; further morpho-functional and molecular investigations are needed to resolve any doubts.

### FUTURE WORK / REFERENCES

In conclusion, exposure to microplastics shows negative effects on gills, with structural and functional alterations that may impair vital processes in aquatic organisms.

It would be advisable to extend the analyses to other organs, such as the liver and intestine, in order to assess potential systemic and long-term effects. Furthermore, further investigation into bioremediation strategies is essential to reduce the presence of microplastics in aquatic ecosystems and limit their environmental impact.