

Effects of orally ingested microplastics in rats as a model organism: preliminary results

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BACKGROUND

In recent years, microplastics (MPs) which are defined as plastic particles with a size of less than 5 mm have become an increasing concern. However, there is limited data on the potential health risks in terrestrial animals and humans.

All the data generated from the scientific research will give a great support in achieving SDGs goals specifically related to the prevention and reduction of plastic pollution.

AIM

The aim of the project is to study the effect of well-defined MPs on the gastrointestinal permeability of mammalian gut using rats as a model organism. Furthermore, the expressions of occludin (Ocln) and zonula occludens-1 (ZO-1) are evaluated as an approach to observe the gastrointestinal barrier function after MPs diet.

RESULTS

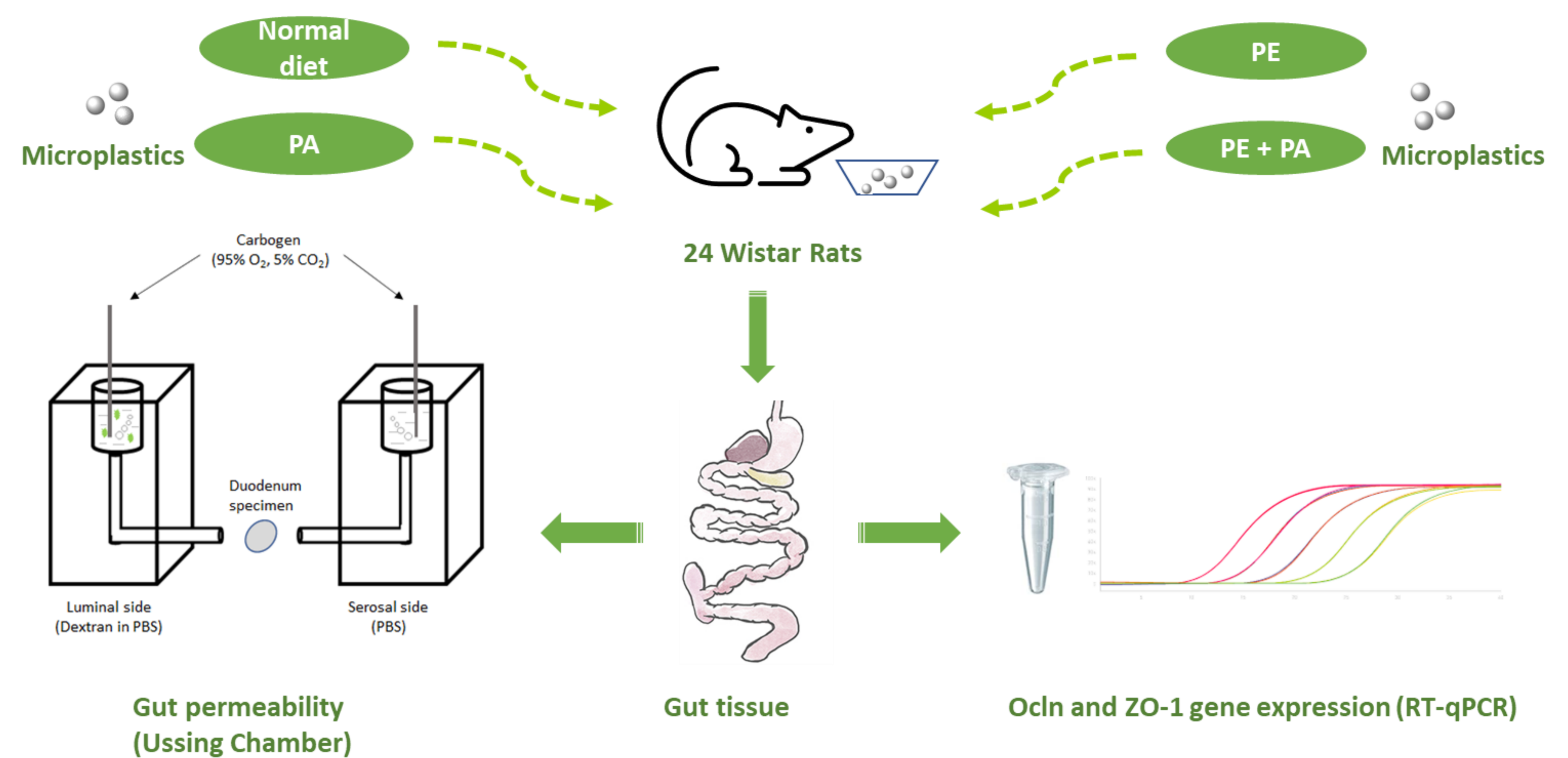
- Results of the Ussing Chamber experiment show that gut tissue from rats receiving MPs had a higher permeability compared to control.
- There is a significant difference in Ocln and ZO-1 gene expression between the control group and the group exposed to PE MPs.

CONCLUSION

- Our findings demonstrated that exposure to MPs has increased permeability of gut segments in a Ussing Chamber.
- As the expressions of ZO-1 and OCLN genes are slightly increased with respect to control group, increased permeability is unlikely mediated via tight junctions.

REFERENCES

1. Jambeck, J.R., et al., *Plastic waste inputs from land into the ocean*. Science, 2015. **347**(6223): p. 768-771.
2. Hwang, J., et al., *Potential toxicity of polystyrene microplastic particles*. Sci Rep, 2020. **10**(1): p. 7391.



METHODS

- In this study, a 2x2 factorial design was used to study the effect of two types of MPs, polyamide (PA, average size 25 µm) and polyethylene (PE, average size 48 µm), ingested through feed.
- Both male and female rats were exposed to MPs for 5 weeks.
- MPs were added to the usual feed (0.1% w/w), indistinguishable from untreated feed.
- After 5 weeks of feeding rats were euthanized. Duodenum tissue samples were used for Ussing Chambers experiments and RT-qPCR.

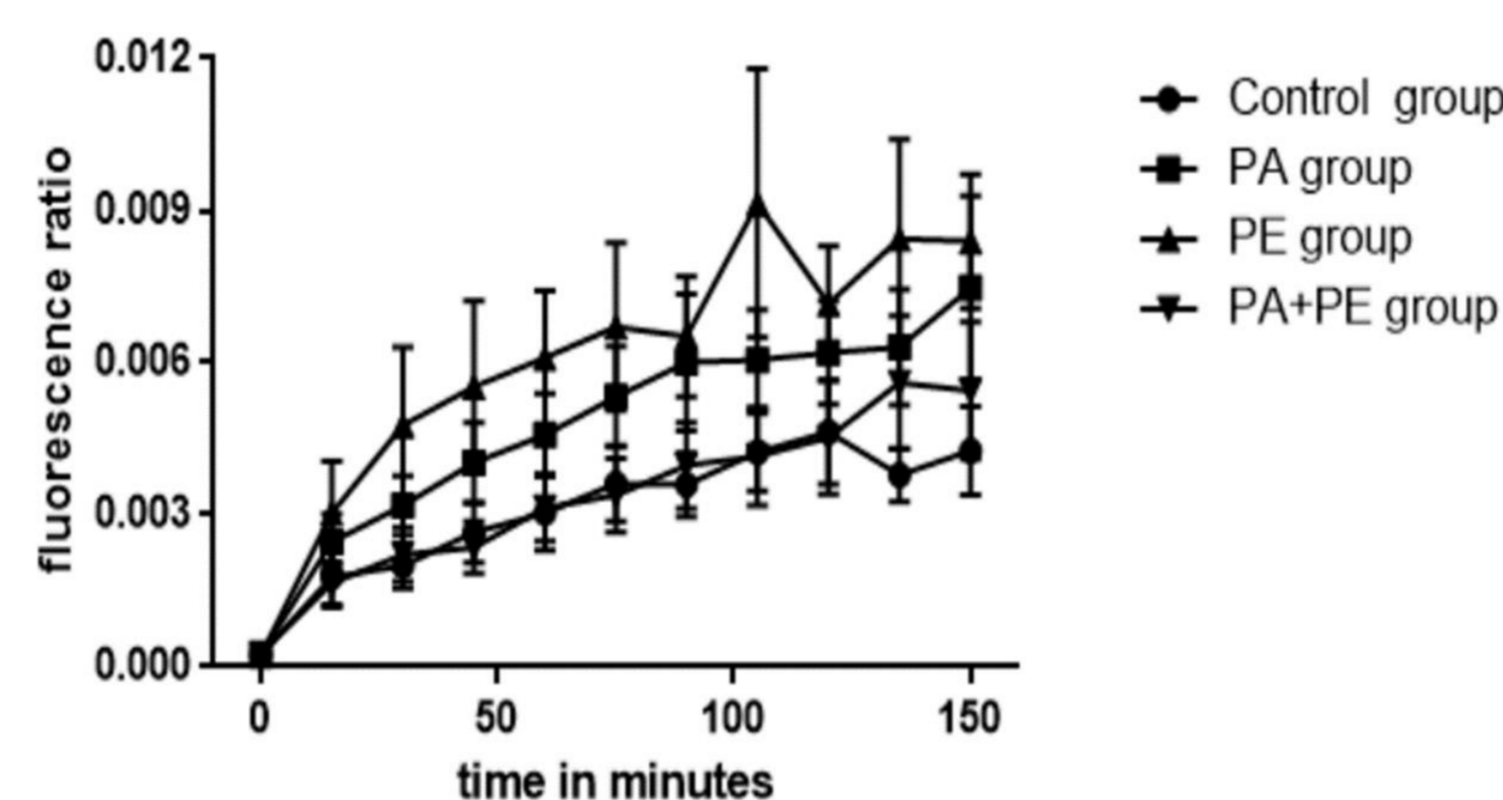


Figure 1. Mean difference of the fluorescence ratio (serosal/luminal) over time measured between groups.

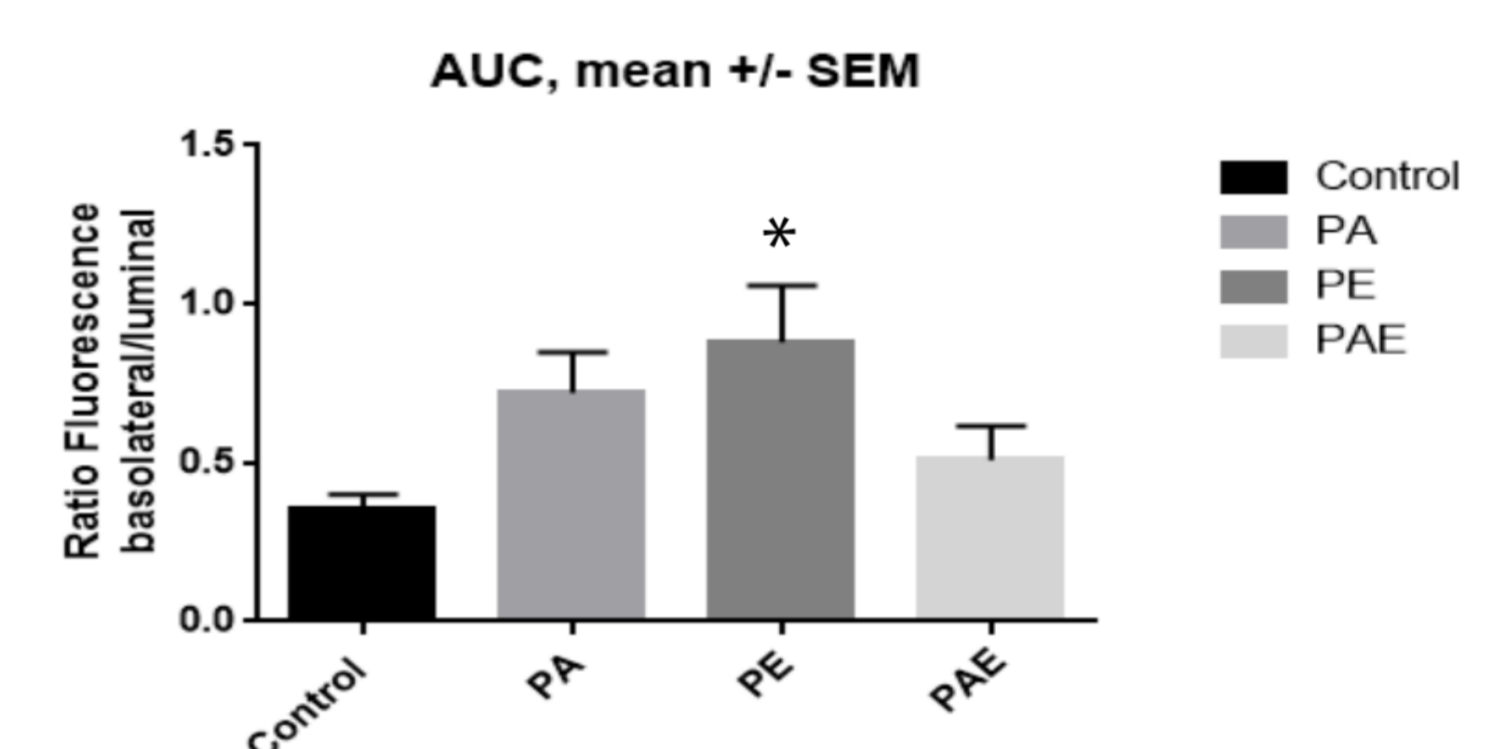


Figure 2. Mean difference of the AUC for each of the diet groups

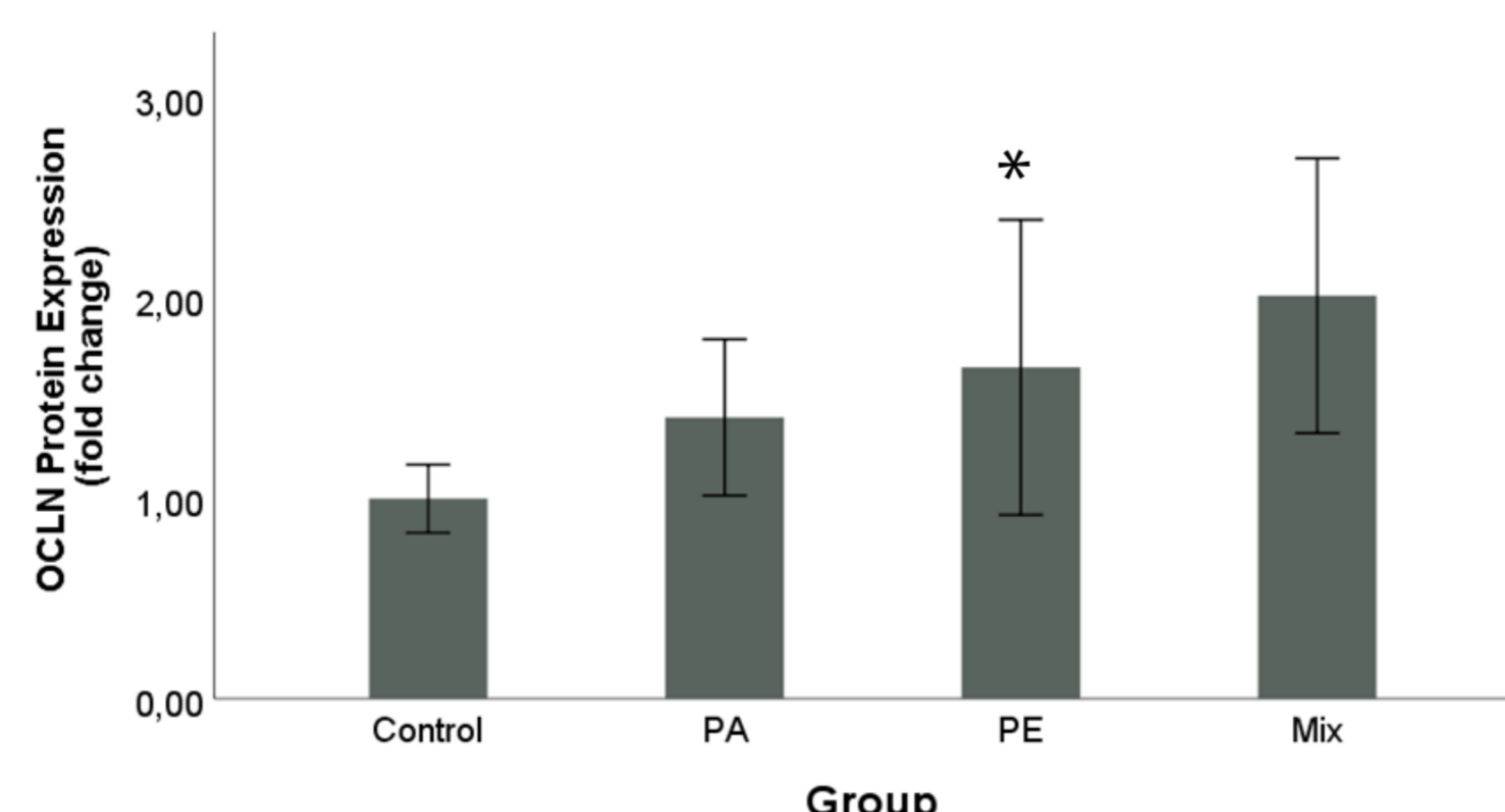


Figure 3. Ocln gene expression of rats receiving a control diet versus MPs treatment.

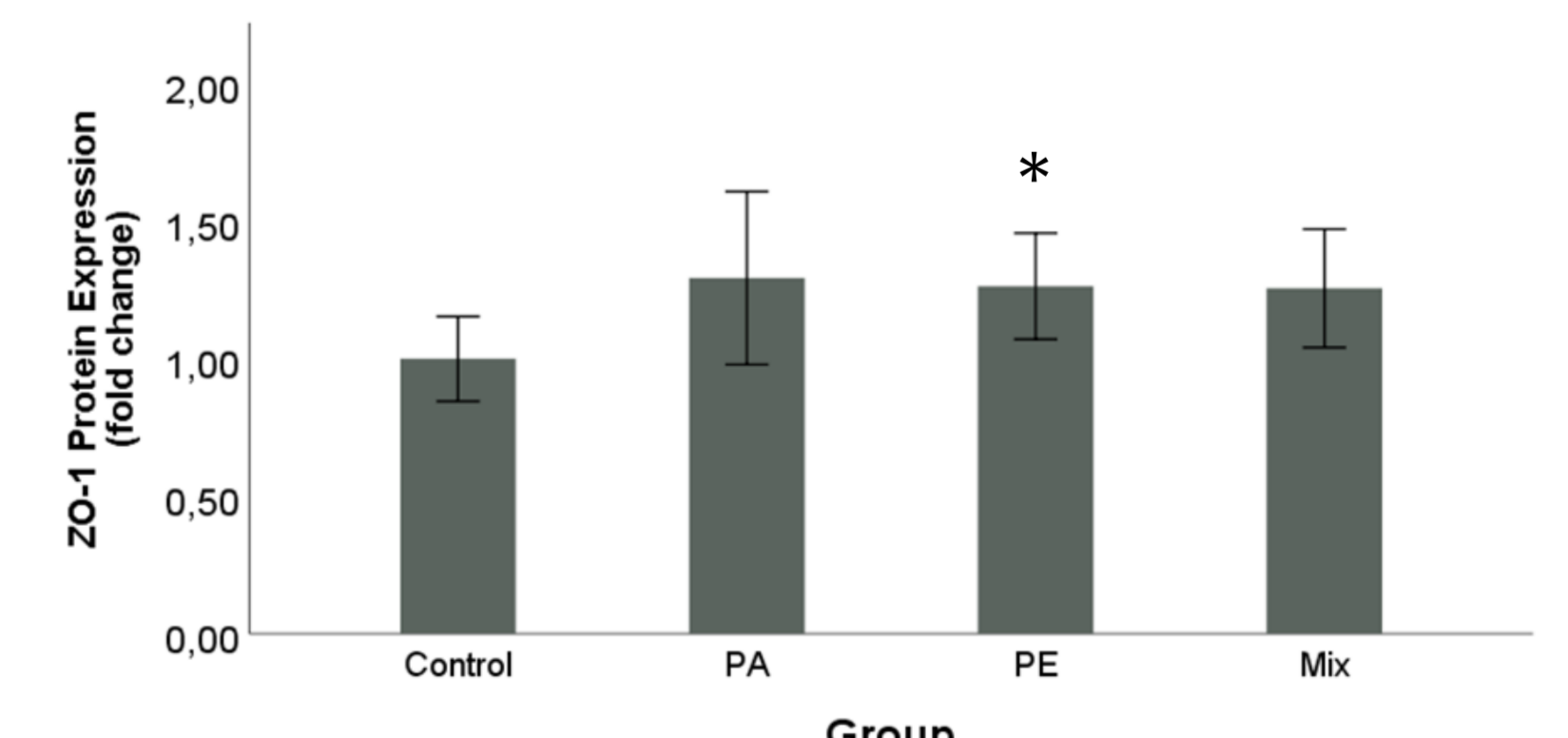


Figure 4. ZO-1 gene expression of rats receiving a control diet versus MPs treatment.