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Analysing the effects of short- and long-term exposure to nanoplastics in *Mus musculus*

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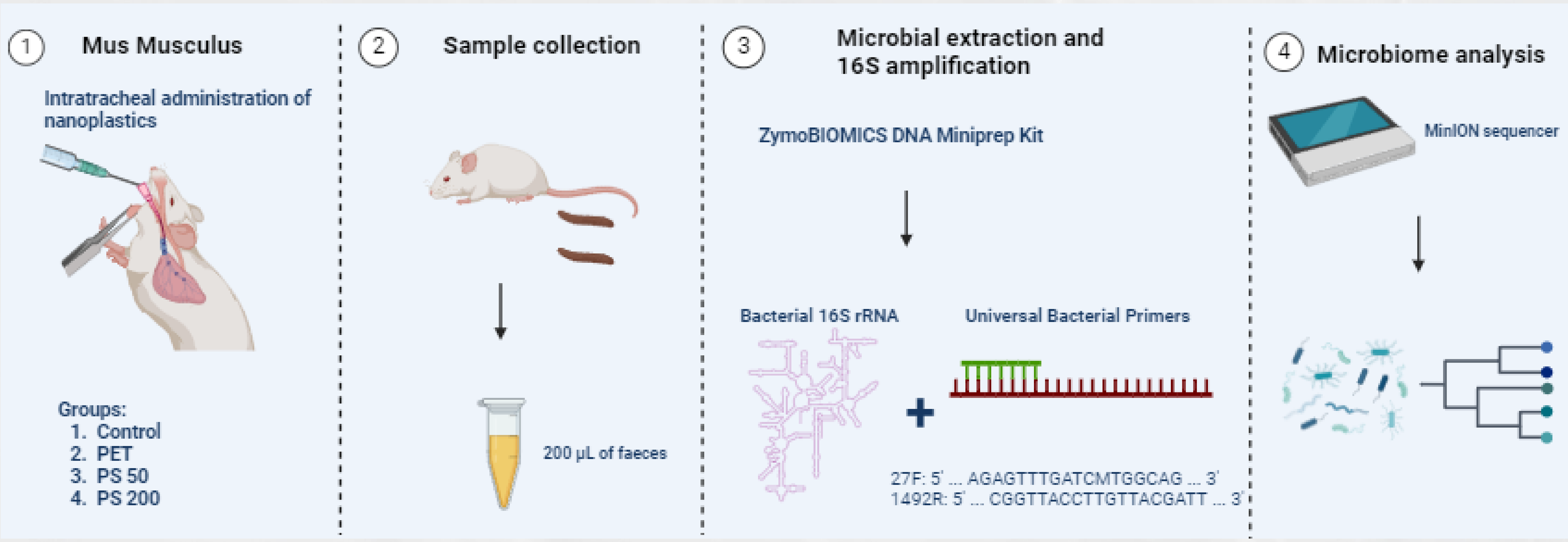
Summary

Micro- and nanoplastics (MNPLs) are increasingly prevalent in the environment due to the **degradation of larger plastic debris** and pose a potential risk to various biological systems. The effects of MNPLs exposure on mammals has been an ongoing research topic to **understand the implications for human health.**

Fifteen different types of MNPLs have been detected in human faces, indicating that **the oral ingestion is one of the main routs of human exposure to MNPLs**. Thus, humans can be consuming MNPLs through **contaminated water, food products (plastic packaging)**, using personal care products (toothpaste), marine and plant products (food chain), etc.

Human gastrointestinal microbiota might be affected due to the presence of MNPLs in the gastrointestinal tract. The human and mice gut microbiota exhibit a 90% overlap at the phyla and genera levels. Additionally, genomic data reveals extensive conservation, with over **85% of genomic sequences shared between humans and mice,** making them an **interesting model for the study of the human microbiota.**

! Experimental Design



Objectives

1. **To evaluate the effects of three different types of NPLs: PS50 (polystyrene, 50 nm), PS200 (polystyrene, 200 nm) as reference material, and PET (polyethylene terephthalate ~150 nm) as true-to-life NPLs on the *Mus musculus* gut microbiota using next generation sequencing.**
2. **To assess potential changes in the alpha- and beta-diversity of microbial communities when treated with NPLs and find bioindicators of NPLs susceptibility.**

! Results

Figure 1. Actual abundance bar plot. Samples are organized into treatment types (Control, PET, PS200, PS50) and subsequently plotted against their time of extraction.

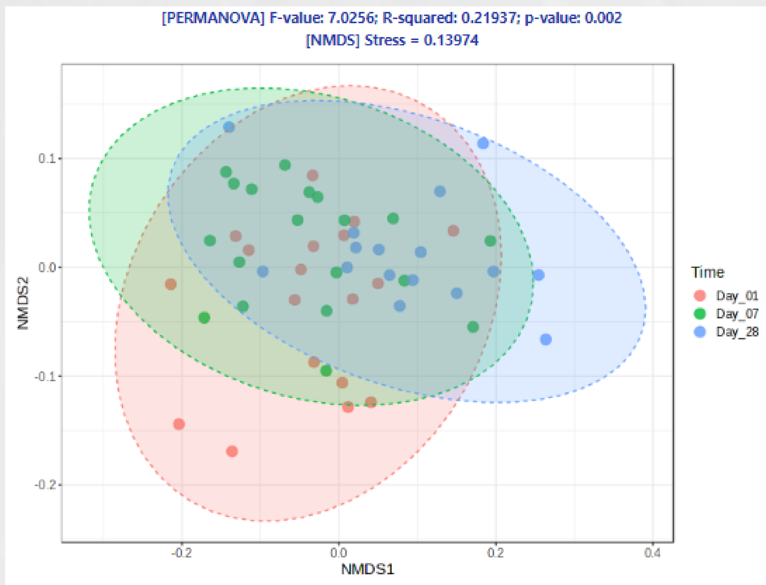


Figure 2. Beta-diversity plot of the samples, grouped by time of fecal extraction

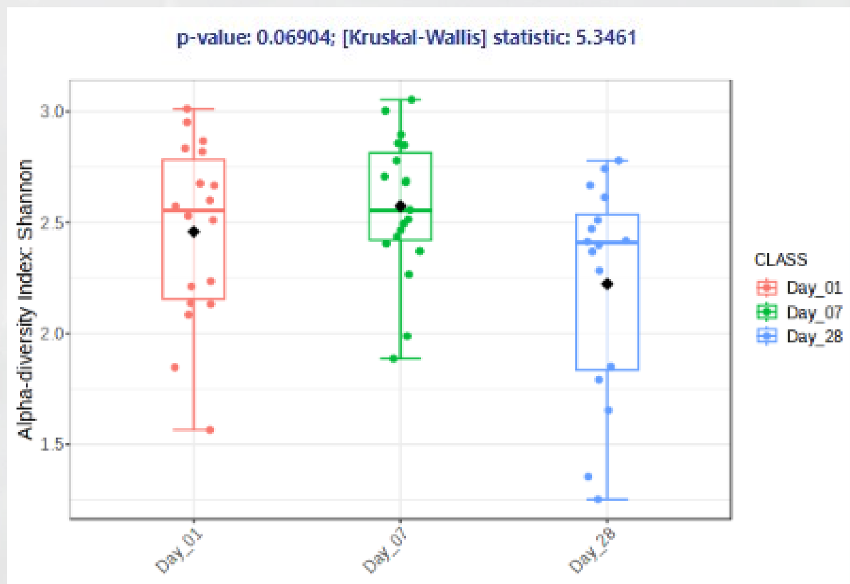


Figure 3. Alpha-diversity plot of the samples, grouped by time of fecal extraction

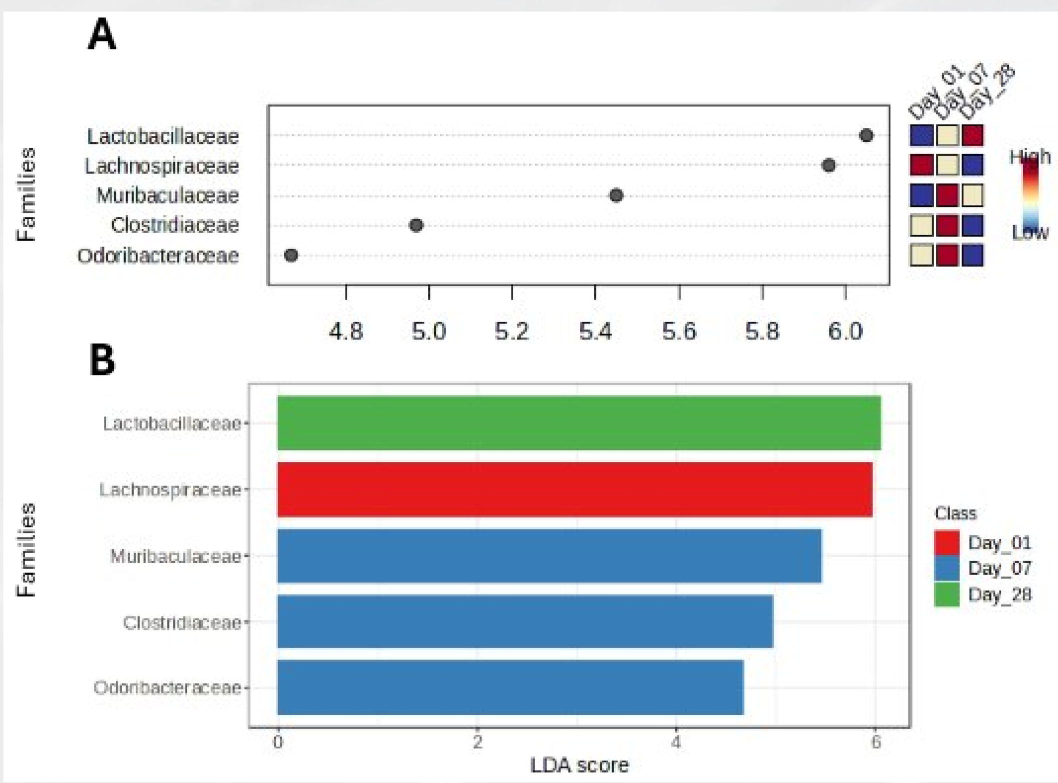


Figure 4. Linear Discriminant Analysis Effect Size (LEfSe) of samples grouped by time after fecal extraction. (**A**) Display of abundance in each time stamp. (**B**) Display of highest abundance in a single time stamp.

Conclusions

1. The beta-diversity between day 1, 7 and 28 is significantly different, while the alpha-diversity is not. However, since the alpha-diversity is near the significance level ($p < 0.05$), this suggests a change in microbial communities over time when treated with plastics.
2. There seem to be no consistent visual differences in microbial diversity between treatments, but there are between time stamps, suggesting an early affect of the nanoplastics that might stabilize over time.
3. *Lactobacillacaea* seem to thrive in the nanoplastic derived conditions, growing in abundance from day 1 to day 28, while *Lachnospiraceae* show the opposite trend, reducing in numbers from day 1 to day 28.

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