# MICROPLASTICS AS VECTORS OF EMERGING CONTAMINANTS IN THE TERRESTRIAL ECOSYSTEM: ECOTOXICOLOGICAL IMPACT

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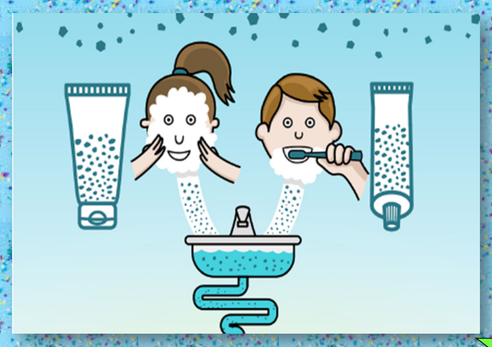
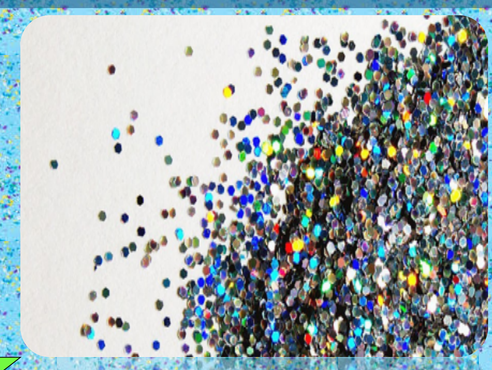
## INTRODUCTION

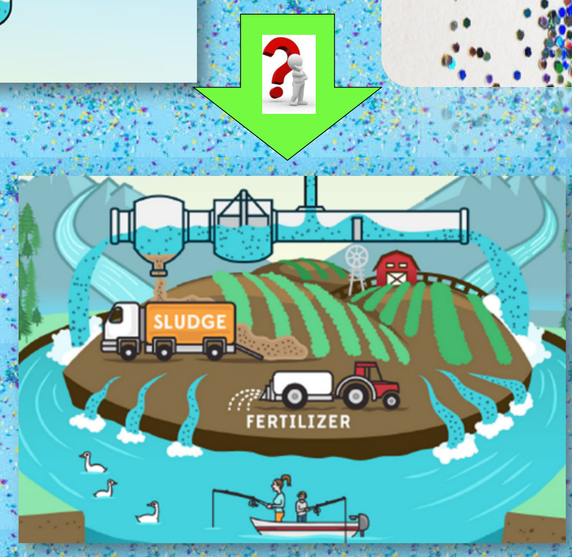
MPs potential impacts in terrestrial ecosystems remain largely unexplored despite numerous reported effects on marine organisms. It is estimated that roughly 32% of plastic waste might find its first receptacle in soils or continental aquatic ecosystems. In fact, approximately 80% of plastic waste have accumulated in landfills and the natural environment.

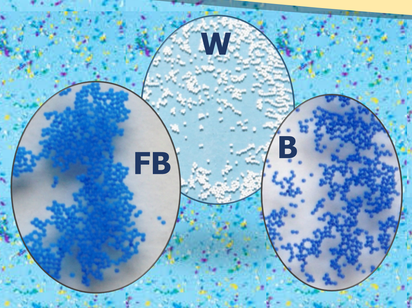
Sewage treatment plants might also be significant sources for continental systems because the untreated domestic sewage is rich in fibers from clothing and microplastic beads from personal care products, among others.

The presence of MPs in the terrestrial system can have harmful effects on different processes, not only their presence but their capacity to carry other contaminants, affecting indigenous organisms of the soil / water system. This makes them vectors of contamination with the consequent risk of dispersion of emerging pollutants.







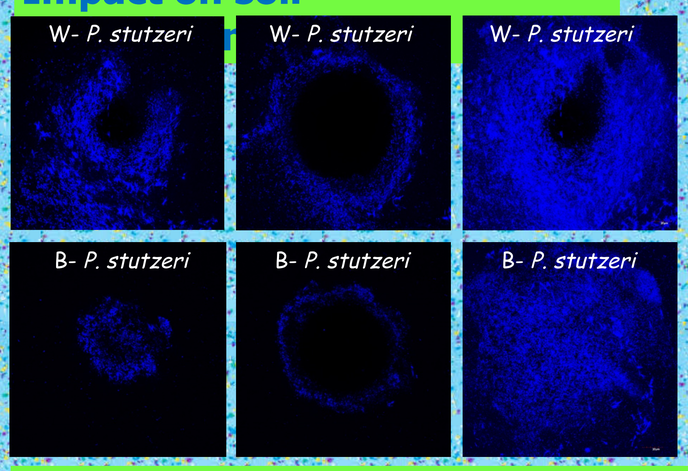



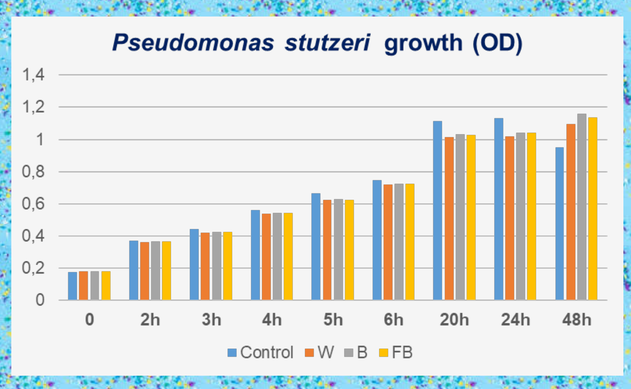

- (B) Blue polyethylene microspheres (212-250 µm)
- (FB) Fluorescent blue polyethylene microspheres (250-300 µm)
- (W) White polyethylene microspheres (250-300 µm)

## AIM

In this study, we have conducted a set of ecotoxicological bioassays: Microtox® Test, *Caenorhabditis elegans* Test, emergence and growth inhibition of two plant species (*Lactuca sativa* and *Zea mays*) to evaluate the potential ecotoxicological risks associated with three polyethylene microspheres

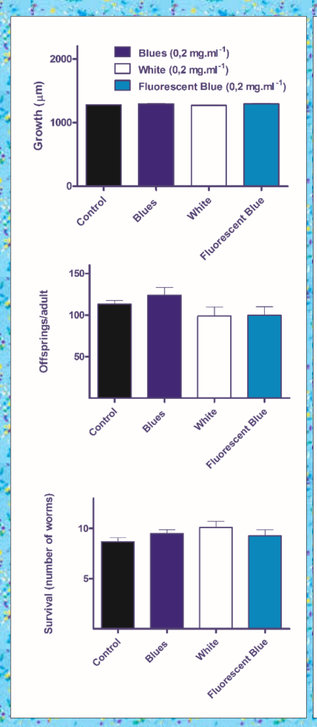
## Impact on soil

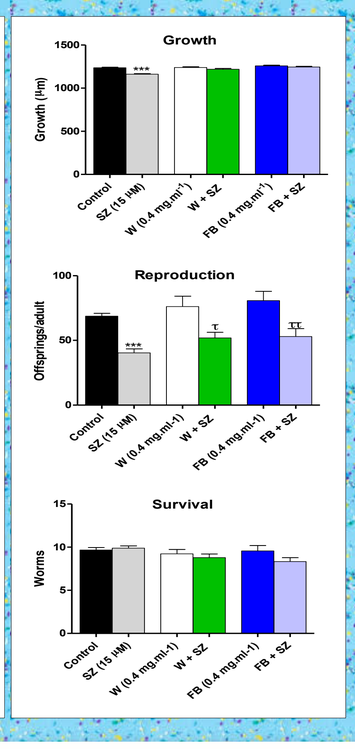



Biofilm: MPs might play a role as a vector for recently observed disease emergence as in the marine environment

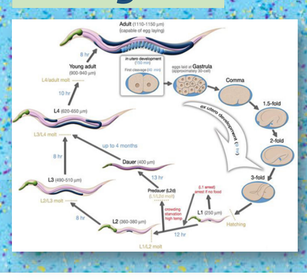
## Impact on soil organisms

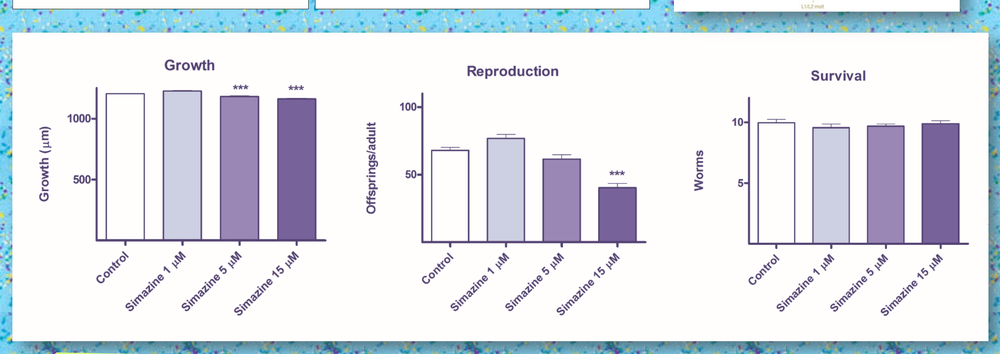


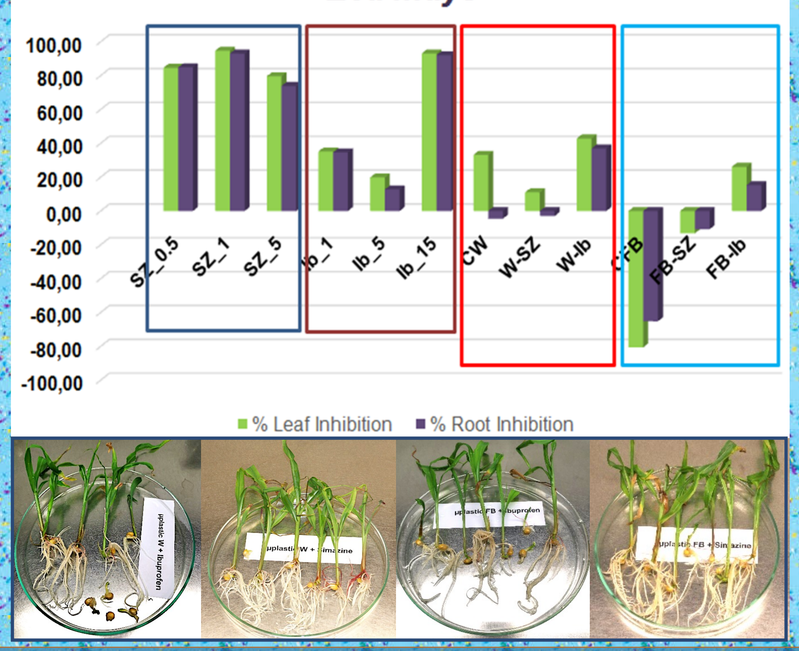

MPs might cause toxicity and act as a new long-term environmental stressor and exert selective pressure on terrestrial organisms: plant and soil organisms

## C. elegans





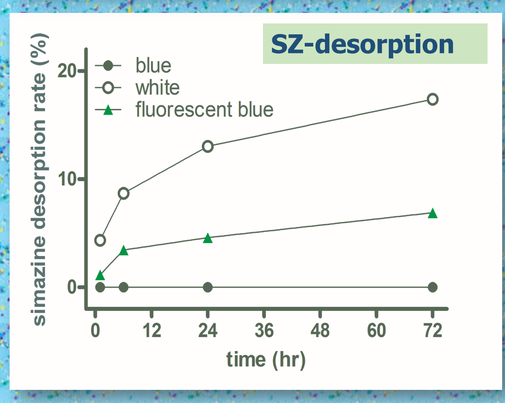




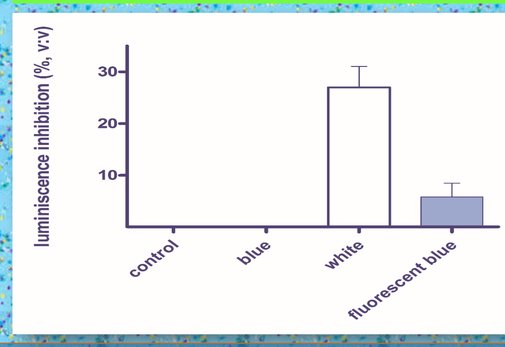

## RESULTS

- No impact of MPs on the growth of *P.stutzeri* was detected
- Biofilm formation was detected on the MPs
- W and FB MPs were effective on *C. elegans* endpoints considered
- SZ (15 µM) significantly reduced both growth and reproduction
- MPs + SZ reduced *C elegans* reproduction
- *L. sativa* root growth was more sensitive to chemicals (SZ and Ibuprofen) than to MPs
- Similar effect was observed in the inhibition of root and leaf length in *Z. mays*, but less sensitive to Ibuprofen, except for the highest concentration
- *Z. mays* was considerably less sensitive to the effect of MPs (alone or combined with the chemicals), especially to FB
- In most of the treatments, the inhibitory responses of root and leave growth were similar
- B- MPs did not inhibit the luminescent capacity of the Vibrio fischeri. At the highest concentration assayed, inhibitions of 27% and 5.79% were obtained in exposures to W- and FB- MPs, respectively
- At 72h post-exposure, the SZ sorption rate was 0%, 13% and 20% corresponding to B-, W- and FB MPs, respectively. The highest SZ desorption rate was obtained from W- MPs assays.

## MPs as vectors of emerging contaminants


## Impact on *V. fischeri* (MICROTOX®)




## Conclusions

- ✓ **The bioassay-set used in this study was an efficient monitoring tool to assess the MPs toxicity in the terrestrial ecosystem**
- ✓ **The observed toxicity is mainly due to the presence of emerging contaminants, rather than to the effect of the MPs**