Assessment of wastewater treatment plant and coastal landfill as important microplastics pathways in the marine environment

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1. Study zone and sampling sites:
   - Edelweiss WWTP
   - Le Havre Harbor
   - Sainte-Adresse

2. Sampling methods:
   a. Water filtration
      - Filtering system consisting of a water pump connected to a flowmeter
      - Stainless steel sieves of different mesh sizes of 500 μm, 200 μm, 80 μm and 20 μm
      - Density separation using ZnCl\textsubscript{2} (d = 1.8 g/cm\textsuperscript{3})
   b. Sediments
      - Sediment samples were collected
      - Treatment under H\textsubscript{2}O\textsubscript{2} and density separation using ZnCl\textsubscript{2}
   c. Wild mussels
      - 20 individuals of Mytilus sp. were collected
      - Mussels were digested using KOH 10%

3. Microplastics analysis
   - Size, color and polymer type

1. WWTP, surface water and sediments
   - Microplastics retention: 98.83%.
   - Microplastics decreased with increasing distance from the WWTP
   - Higher concentration in site 5 (next to the coastal landfill).
   - Mussels from site 5 ingested a significantly higher number of suspected MPs (2.75 ± 3.08 items/g).

2. Microplastics similarity
   - 13 types of polymers were identified using micro-Raman spectroscopy.
   - A similarity in polymers composition between mussels and sediments was observed except in site 5.

Discussion and Conclusion
- The WWTP has a retention efficiency of 98.83% but yields to a daily discharge 227 million MPs
- We highlight the importance of coastal landfills as important MPs sources
- Mussels are prone to ingest small microplastics ( < 200 μm ) and show a polymer similarity to that of sediments: promising sentinel species for small MPs.

\textbf{Context}
- Marine Plastic debris have been tremendously increasing since the last decade
- Entry routes of microplastics (MPs; Plastics of a size between 1 μm and 5 mm) into the marine environment not well known

\textbf{Objectives}
- Role of a municipal wastewater treatment plant (WWTP) effluent and an abandoned coastal landfill as pathways for microplastics (MPs) input into the marine coastal environment.
- Follow the MPs released by WWTP in the marine environment along a distance gradient in three compartments (sub-surface water, sediments and mussels).

\textbf{Materials and Methods}

\textbf{Results}