SORPTION OF OKADAIC ACID LIPOPHILIC TOxin ONTO PLASTICS IN SEAWATER

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Plastics are everywhere and their application goes from packaging and construction materials to transport, electronics and household objects (PlasticsEurope, 2019). The most common petro-polymers are polyethylene (PE), polypropylene (PP), polystyrene (PS), polyvinyl chloride (PVC), polyamide (PA), polyethylene terephthalate (PET) and polyvinyl alcohol (PVA) (Avio et al., 2016). It is predicted that by 2025, 250 million tons of plastic waste will enter the ocean (Jamebeck et al., 2015).

Several marine phytoplankton species are known to sporadically overgrow causing harmful algal blooms (Zingone and Erenvoorden, 2000) and releasing toxic metabolites – the marine biotoxins (Gerssen et al., 2010). Okadaic acid (OA) is a regulated lipophilic biotoxin that can be accumulated in shellfish’s tissues and cause adverse effects in human consumers (EFSA, 2008).

The affinity of marine toxins to polymeric materials (MacKenzie, 2010) suggests that plastic debris could retain dissolved toxins, which ultimately may become available to filter feeders and other marine organisms (Green, 2016; Ward and Kach, 2009). This study, aims to examine whether OA can sorb onto four types of plastic materials using 96-h laboratory experiments with spiked saline water.

Materials and Methods

Okadaic Acid

Add sorbates (10 ng mL⁻¹)

Add 6 mm circular fragments of each daily-use plastics (sorbents) (4 g L⁻¹)

Immersion into spiked NaCl solution (sallinity 35) for 96 h;

T = 18 ± 2 °C

Constant pH

Storage at -20 °C

Direct quantification from seawater by S₈₅₀ P₈₅₀ E₈₅₀

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Results

% OA removal from seawater after 48h

30 ± 5.1 % (PET)

37 ± 9.5 % (PP)

62 ± 7.1 % (EPS)

83 ± 19.9 % (PS)

Acknowledgments

These results bring new challenges for biotoxins pathway, availability and toxicity in coastal environments – it may potentially increase bioavailability and accumulation of this toxin in shellfish. Further studies on the stability of OA-plastic aggregates in seawater should elucidate its impact on bivalves.

References

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