Toxic plastic particles: Microplastic as vector for cyanobacterial toxins microcystin-LR and -LF

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Bloom of cyanobacteria → Potential Toxin Producers → Microcystin

- Arginine
- Leucine
- Phenylalanine
- Microcystin-LR
- Microcystin-LF
Microplastics

All plastic particles < 5 mm (all dimensions)

Types: primary and secondary

Mainly secondary
Polymers commonly use

**PE-LD**
Reusuable bags, trays and containers, agricultural film, food packaging film, etc.

**PVC**
Window frames, profiles, floor and wall covering, pipes, cable insulation, garden hoses, inflatable pools, etc.

**PET**
Bottles for water, soft drinks, juices, cleaners, etc.

**PS**
Food packaging (dairy, fishery), building insulation, electrical & electronic equipment, inner liner for fridges, eyeglasses frames, etc.
Overview of the experiment

**MC – LR**
**MC – LF**

- pH 5
- pH 7
- pH 9
- pH 11

PET
Polystyrene
PVC
Polyethylene

0.09-0.125 mm
0.25-0.5 mm
1 mm-5 mm
Control

*Experiment performed in artificial fresh water (AFW) – Adjusted with nitric acid and sodium hydroxide*
Polymers particles

- PET
- PS
- PE
- PVC

Size:
- 1 – 5 mm
- 0.25 – 0.5 mm
- 0.090 – 0.125 mm
Matrix-assisted laser desorption/ionization mass spectrometric imaging (MALDI MSI)

Optical image of PET before matrix application

All three adducts of (H, Na, K) of MC-LF were detected

[MC-LF + Na]^+ at m/z 1008.5006
Conclusions

• Microplastics can be a vector of hydrophobic toxic compounds;
• Size of microplastic affects adsorption of microcystins onto plastics;
• The pH of the matrix appears to affect adsorption of microcystins onto plastics;
• It is not possible to predict the behaviour of microcystin analogues by just analysing one variant (MC – LR).

Next steps

• Evaluate the adsorption of other microcystin variants onto microplastics, singular and mixtures;
• Investigate the desorption capacity of the microcystin from microplastics;
Acknowledgement
Thank you for your attention!