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INTRODUCTION

Challenges in the analysis of microplastics

The 79% of plastic waste ever produced has accumulated in landfills and in the environment. Under the effect of climate agents, big pieces of plastic are degrading in microplastics (MPs), contaminating oceans, freshwaters and soil and eventually ending up in the food chain.

Out of 136 research articles reporting the occurrence of MPs in food, none applies a validated analytical method.

Therefore, we decided to perform a critical evaluation of a method for the analysis of MPs in drinking water based on Nile Red staining and fluorescence microscopy

Contamination

Airborne / Lab material / Chemicals



Sample preparation

Loss of MPs

Multidimensionality

Of the data necessary for the full characterization of MPs



Validation

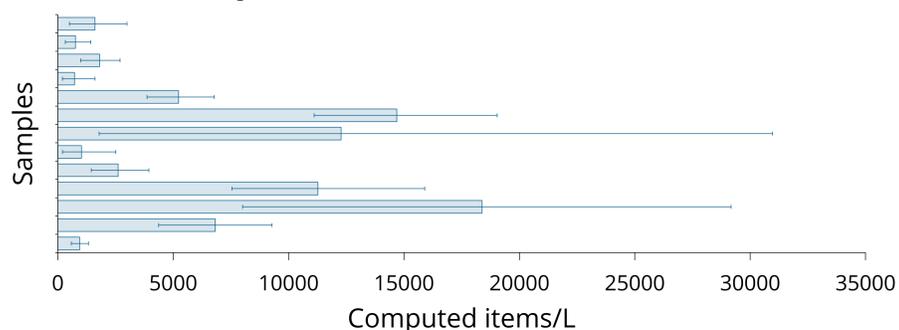
Lack of analytical standards and reference material

RESULTS

Method performance

Limit of detection	1.12 ppb
Limit of quantification	3.36 ppb
Linearity	$R^2 = 0.9937$
Linearity range	0.01 – 1.5 ppm
Repeatability (1.0 ppm)	VC% = 10.7%
Repeatability (0.1 ppm)	VC% = 12.0%
Within-lab reproducibility (1.0 ppm, 3 days)	VC% = 16.4%
Within-lab reproducibility (0.1 ppm, 3 days)	VC% = 29.1%
Recovery (1.0 ppm)	$103 \pm 9 \%$
Recovery (0.1 ppm)	$108 \pm 5 \%$
Sizing, linearity	$R^2 = 0.9923$
Sizing, working range	10 - 200 μm

Analysis of MPs in bottled water



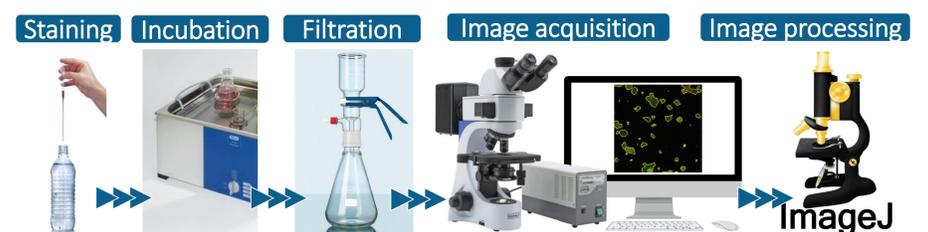
Error bar: 95% confidence interval.

METHODOLOGY

Nile Red and fluorescence microscopy

A Nile Red staining protocol was optimized, followed by a filtration step and the acquisition of images via a camera installed on the fluorescence microscope.

An ImageJ macro allows the automated processing of the images in order to yield the number of particle per filter and the particle size distribution.



CONCLUSIONS

Nile Red potential in the analysis of MP

- 1 Nile Red staining and fluorescence microscopy allow a fast and automated analysis of MPs in drinking water.
- 2 Validation of quantitative methods for the analysis of MPs in aqueous sample is possible.
- 3 Nile Red staining and fluorescence microscopy coupled with a further analytical techniques able to yield the chemical characterization of MPs could represent a powerful tool for the complete characterization of MP contamination.

OUTLOOKS

Towards reliable and complete analysis of MP

A further development of the method in combination with direct mass spectrometry is currently under study.

This multimodal characterization method, the first in MP analysis to report an exhaustive assessment of quality parameters, already gave promising results in overcoming the interference of surface chemical damage, weathering, and contamination.

CONTACT



Scan me!

ACKNOWLEDGEMENTS

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