Analytical method development using solid-phase extraction method and liquid chromatography coupled to HR and LR-MS for the detection of PMTs in waters from intermittent rivers

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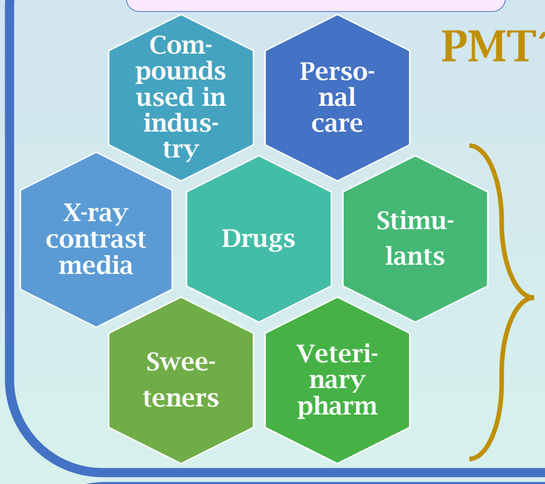
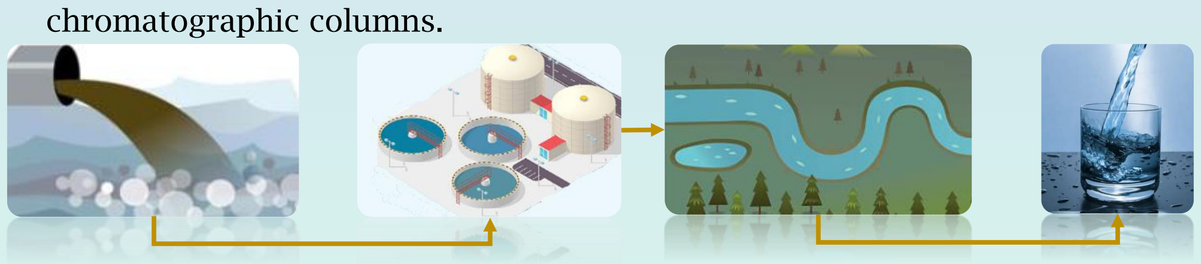
Introduction



Persistent, Mobile and Toxic compounds (PMTs) are organic and highly polar compounds that, when emitted in significant quantities, can pose a threat to the quality of surface water, groundwater aquifers and even drinking water supplies because they are very mobile and conventional wastewater treatments are not able to degrade or remove them.

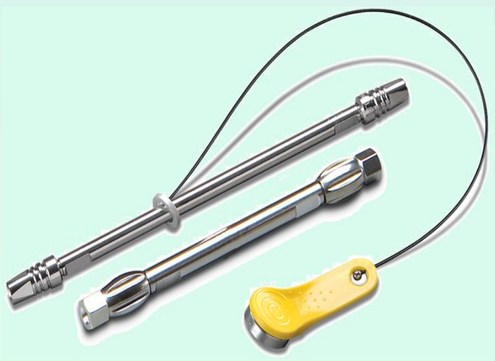
There is currently limited information on the presence of PMTs in the aquatic environment due to the analytical issues because these compounds present low extraction efficiencies from water matrices and weak retention in conventional chromatographic columns.



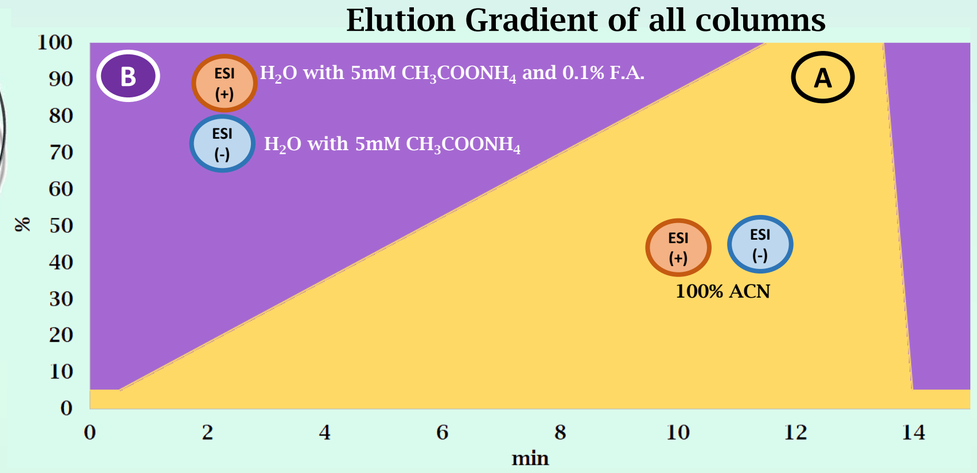
The aim of this research is to develop an analytical method in target mode that allows to identify and quantify more than 150 compounds with a wide range of polarity.

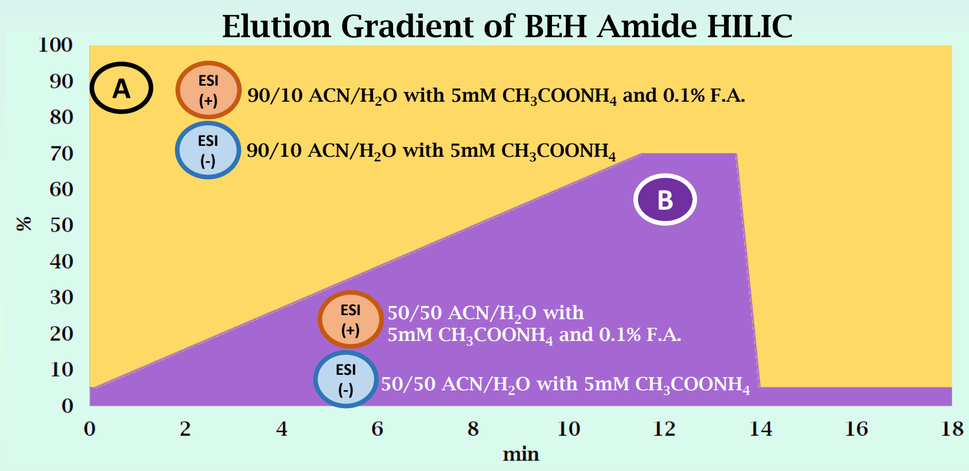
Method Development

Comparison of four chromatographic columns to select those with the better analyte retention.

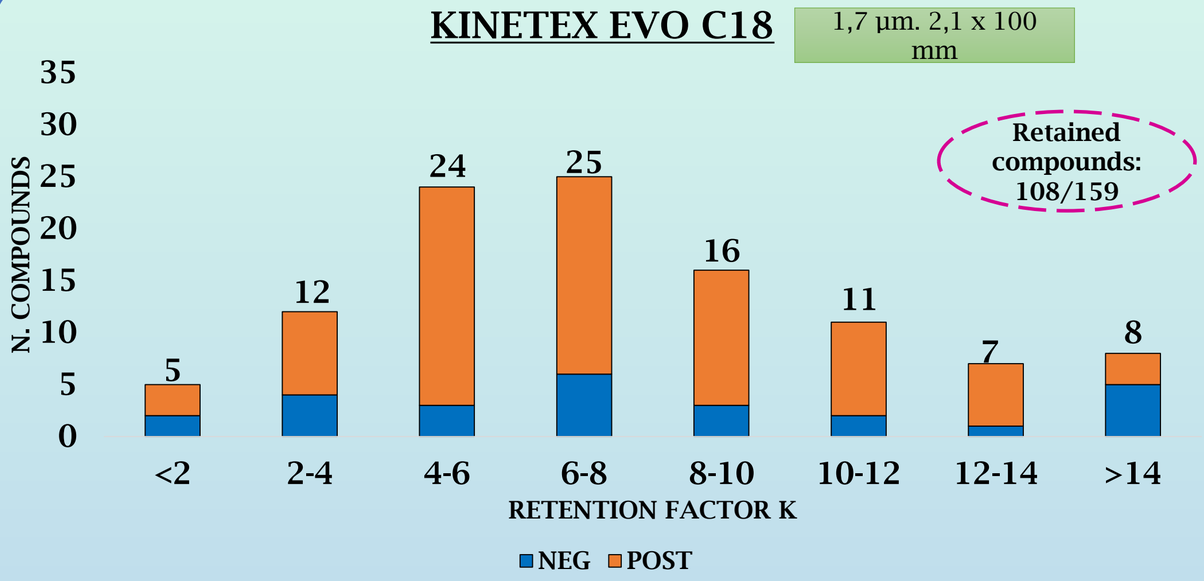


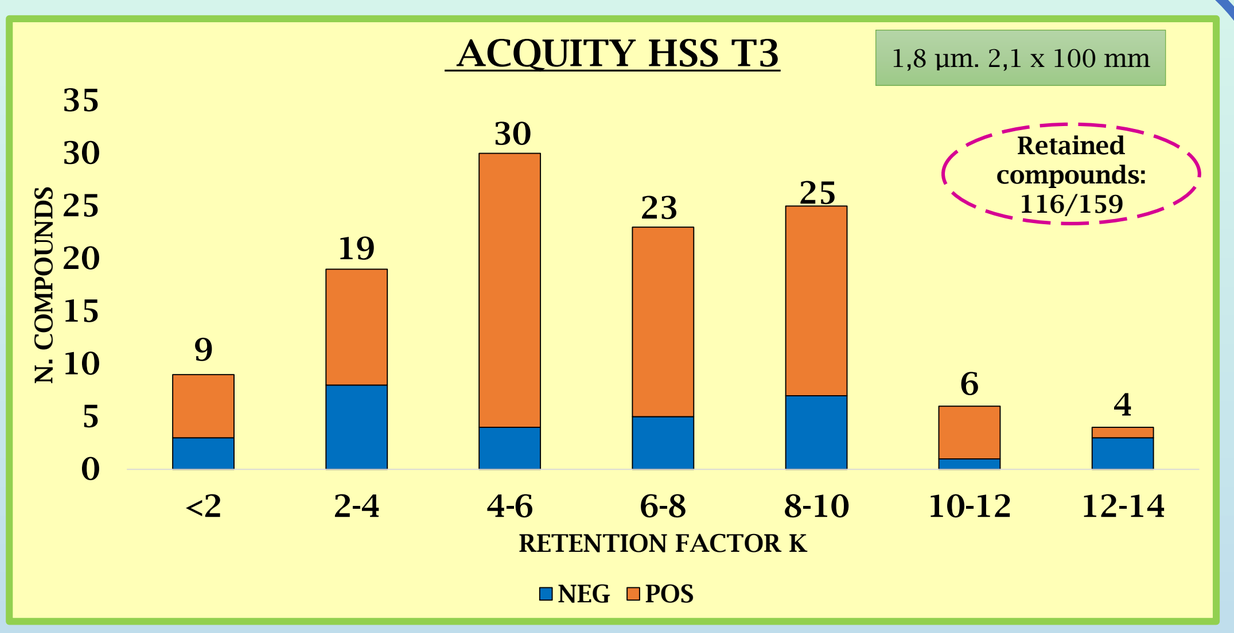
Flow rate 0,4 mL min^{-1}

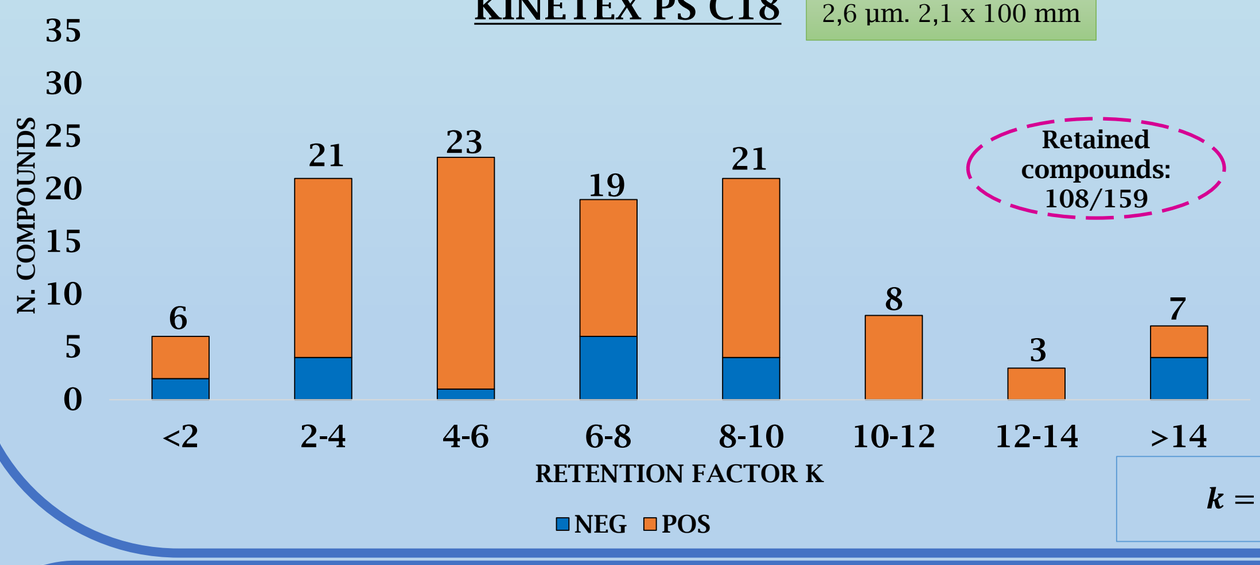




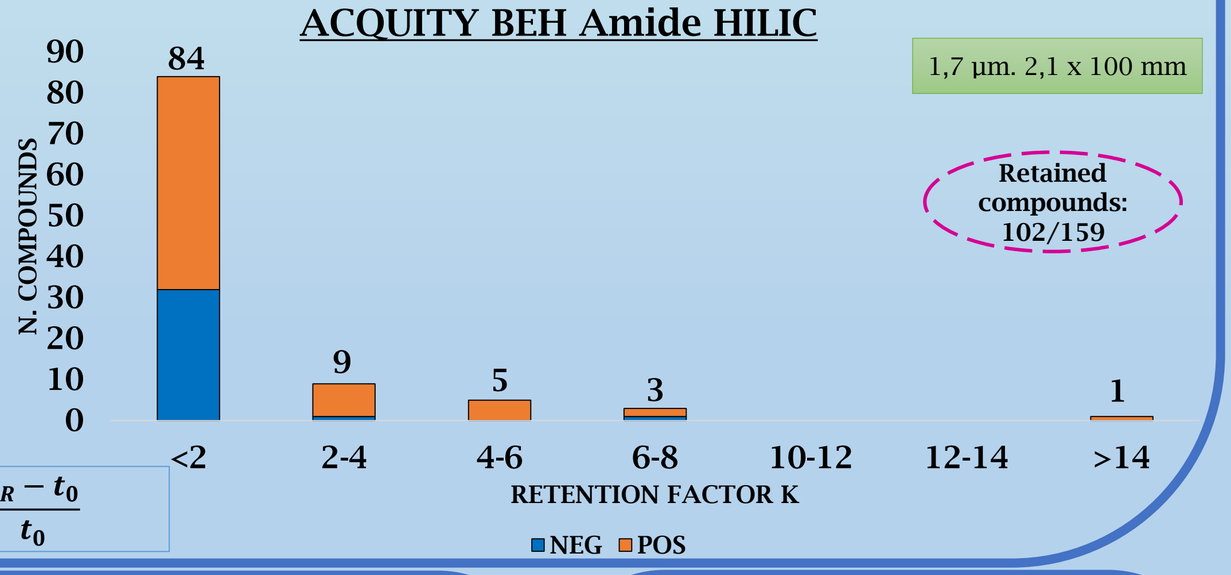
Results







$$k = \frac{t_R - t_0}{t_0}$$



Conclusions

- 87% of the analytes were retained in at least one of the columns.
- Acquity UPLC BEH Amide HILIC column retained compounds that were not retained by another column (azithromycin, irgasan, triclocarban, chlorpromazine, sulfaguanidine, sulfamic acid hydroxychloroquine). In particular the latter drug was used massively in recent months as a treatment for COVID.
- HSST3 is the most appropriate column for the detection and quantification of the compounds of interest because it allows the simultaneous separation of polar and non-polar analytes. However, the HILIC column will also be optimized to evaluate metabolites and TPs.
- After the development phase of chromatography, the efficiency of SPE with multilayer cartridges (HLB (200 mg), mixture of WCX (100 mg), WAX (100 mg) and PPL (150 mg)) and two different elution steps will be evaluated.

Acknowledgements

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