Development of Green Approaches for Preconcentration of Local Anesthetics in Biological Matrices

Pereira, Joana [A*]; Rocha, Daniela C.[A]; Neng, Nuno R. [A,B,C]; Torres, M. Edite [A,B]; Quintas, Alexandre [A,B]; Ahmad, Samir M. [A,B,C]

A – Egas Moniz School of Health and Science, Campus Universitário - Quinta da Granja, Monte da Caparica, 2829-511 Caparica, Portugal.
B – Laboratório de Ciências Forenses e Psicológicas Egas Moniz, Molecular Pathology and Forensic Biochemistry Laboratory, Centro de Investigação Interdisciplinar Egas Moniz, Campus Universitário, Quinta da Granja, Monte de Caparica, 2829-511 Caparica, Portugal
C – Centro de Química Estrutural, Institute of Molecular Sciences, Departamento de Química e Bioquímica, Faculdade de Ciências, Universidade de Lisboa, 1749-016 Lisboa, Portugal
*** E-mail: joanapinelapereira@hotmail.com**

MEDLIFE

INTRODUCTION

Lidocaine, procaine, benzocaine and tetracaine (Figure 1) are local anesthetics commonly used in medical and dental treatments [1]. However, they are also important from a forensic point of view, since they can be used as adulterants of cocaine [2] or as substances of abuse, exhibiting toxicity in the Central Nervous System and in the Cardiovascular System [1,3]. Combining this fact with the environmental issues that prevail in our day-to-day, it is necessary to develop analytical methods that allow, in a simple, fast and effective way, to monitor these analytes in complex biological matrices, considering the principles of Green Analytical Chemistry.
In this sense, in this work, two green and innovative analytic techniques are being developed and compared, namely the adsorptive bar microextraction (BAμE) and the solid phase microextraction (SPME) with LC Tips, used with the objective of performing the extraction and the pre-concentration of the four target anesthetics followed by gas chromatography coupled to mass spectrometry operating in the acquisition mode of selected ion monitoring (GC-MS(SIM)).

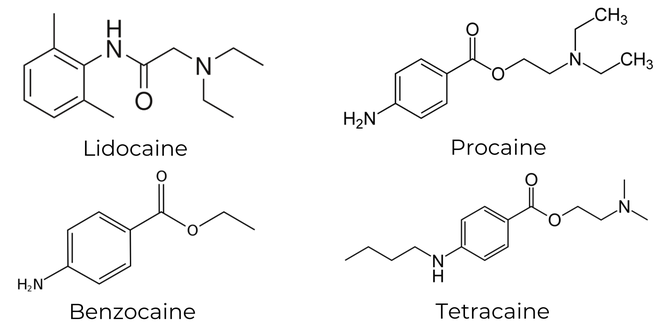
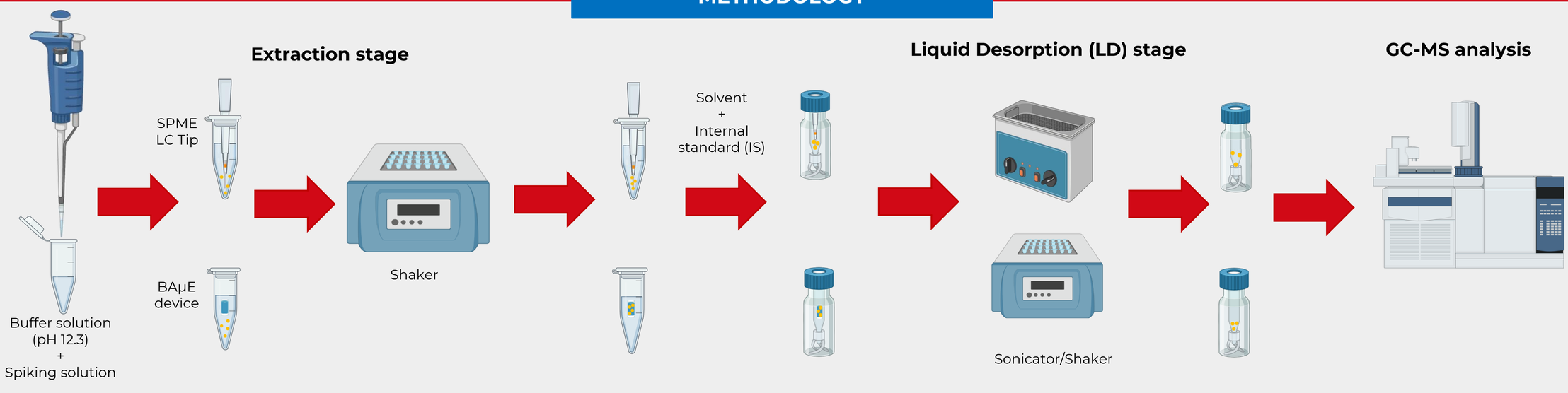


Figure 1: Chemical structures of the target anesthetics.

METHODOLOGY



RESULTS

Extraction Optimization

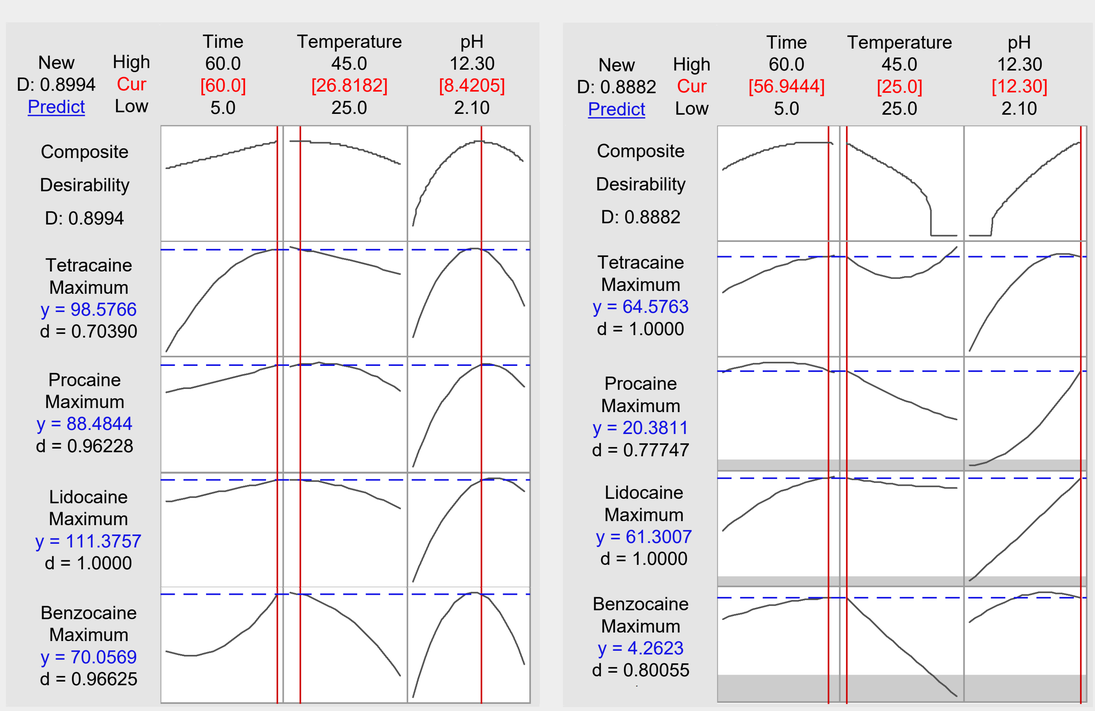


Figure 2: Box-Behnken design optimization for the extraction stage of BAμE (left) and SPME LC Tips (right) devices.

Retroextraction Optimization

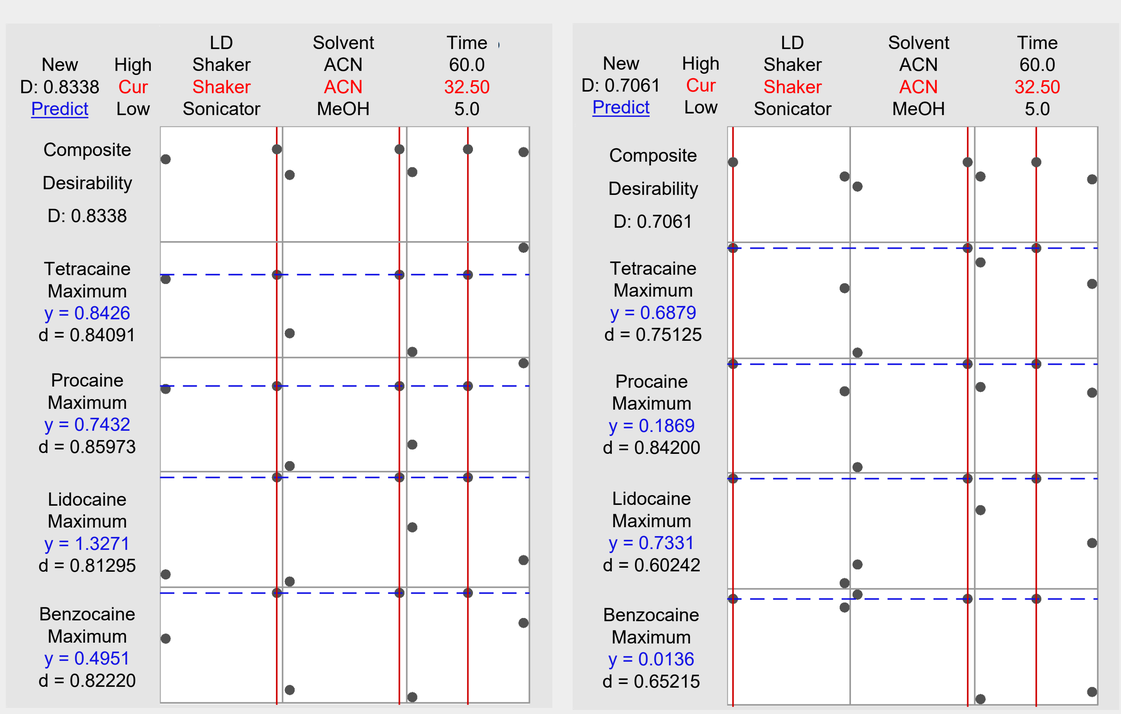


Figure 3: Factorial design optimization for the liquid desorption stage of the procedure using BAμE (left) or SPME LC Tips (right) devices.

CONCLUSIONS

The two methodologies revealed good results, great simplicity, easy handling and low cost.

Preliminary results in aqueous matrix indicate that BAμE devices have better extraction efficiencies than SPME LC Tips when compared to a standard mixture.

The optimized method will be validated to monitor the selected anesthetics in biological matrices.

REFERENCES

[1] D. Becker, K. Reed; *Anesthesia progress* **2012**, *59*, 90-103.

[2] S. Laposchan, R. Kranenburg, A. Asten; *Science & Justice* **2022**, *62*, 60-75.

[3] K. Sekimoto, M. Tobe, S. Saito; *Acute Medicine & Surgery* **2017**, *4*, 152-160

ACKNOWLEDGMENTS

Centro de Química Estrutural is a Research Unit funded by Fundação para a Ciência e a Tecnologia through projects UIDB/00100/2020 and UIDP/00100/2020. Institute of Molecular Sciences is an Associate Laboratory funded by FCT through project LA/P/0056/2020. This work was financed by national funds through FCT – Fundação para a Ciência e a Tecnologia, I.P., under the Project UIDB/04585/2020 and is taking place within the research grant Novos Talentos Química 22-23 from Calouste Gulbenkian Foundation. Centro de Investigação Interdisciplinar Egas Moniz is a Research Unit funded by FCT through project UIDB/04585/2020.