Development of Green Methodologies for Pre-Concentration of Local Anaesthetics in Biological Matrices

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INTRODUCTION

Lidocaine, procaine, benzocaine and tetracaine (Figure 1) are local anaesthetics 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 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, with the objective of performing the extraction and the pre-concentration of the four target anaesthetics followed by gas chromatography coupled to mass spectrometry with selected ion monitoring mode (GC-MS(SIM)).

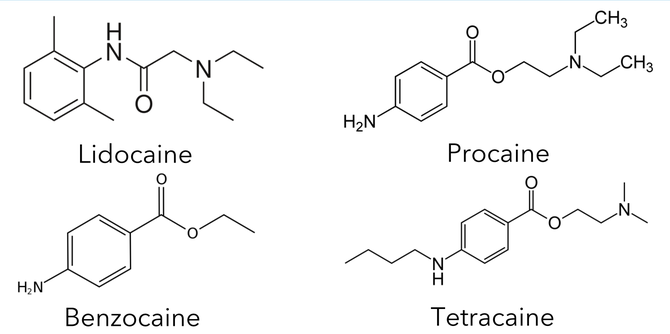
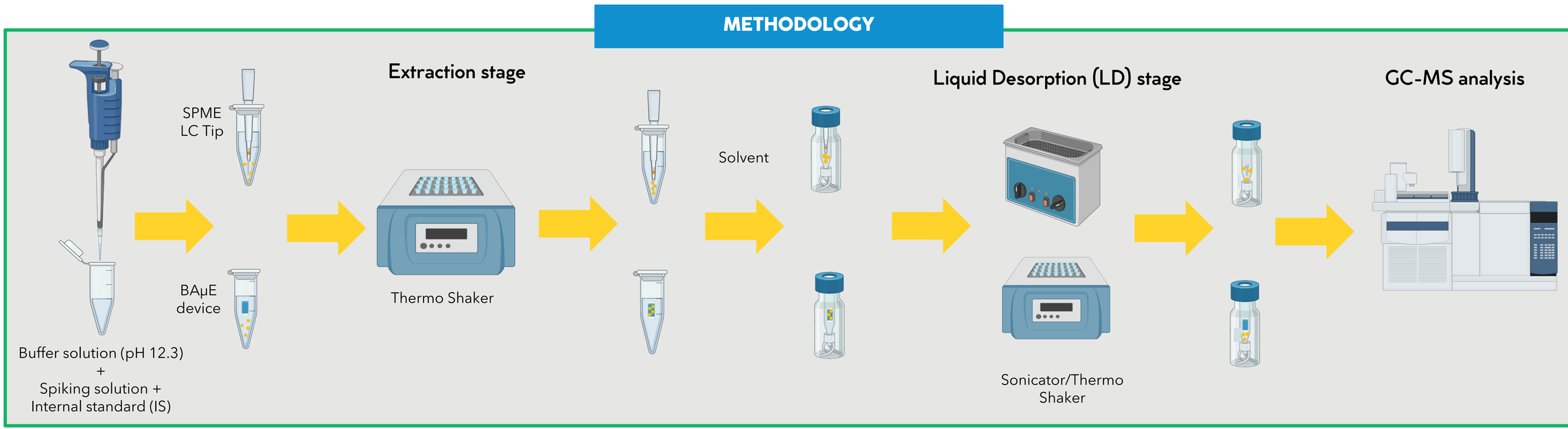


Figure 1: Chemical structures of the target anaesthetics.

METHODOLOGY



RESULTS

Extraction Optimization

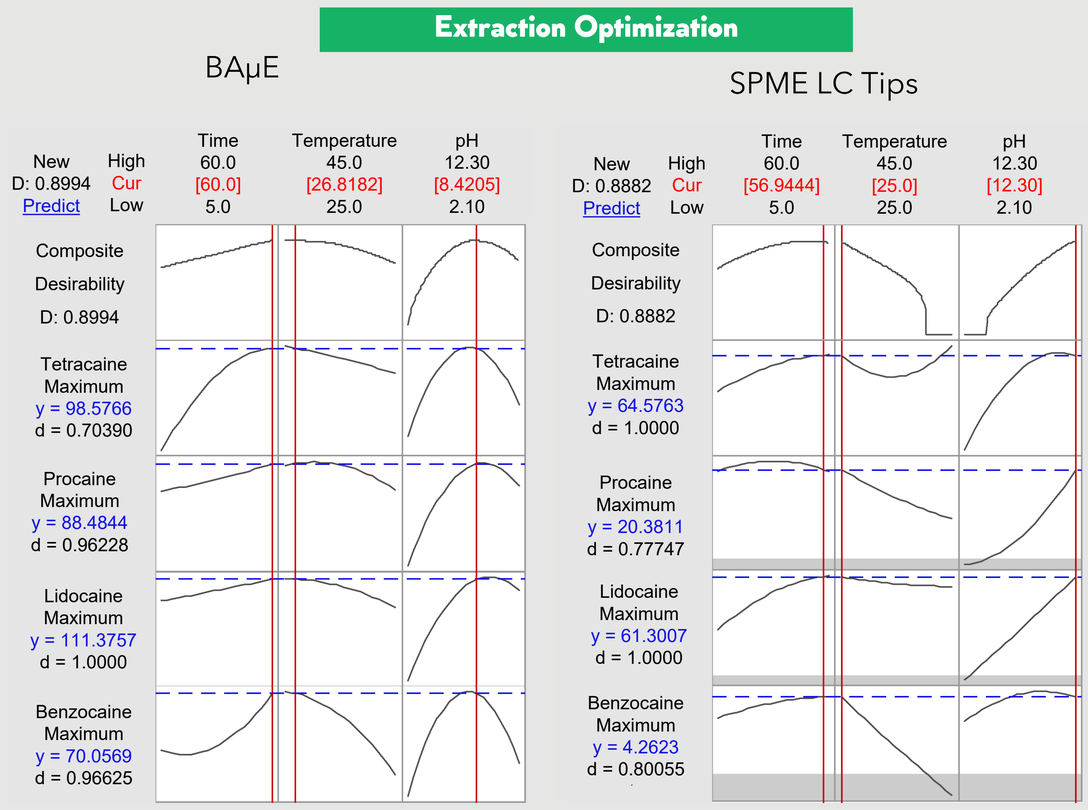


Figure 2: Box-Behnken design optimization for the extraction stage of BAμE (left) and SPME LC Tips (right) devices.

LD Optimization

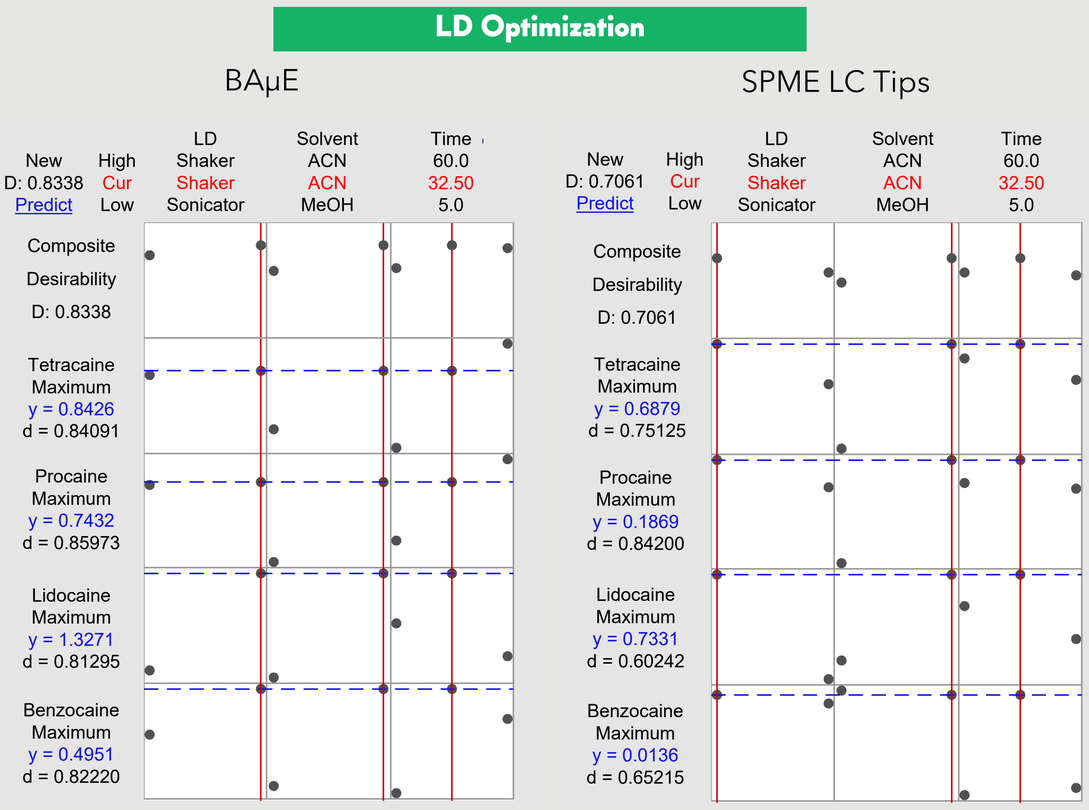


Figure 3: Factorial design optimization for the LD stage of the procedure using BAμE (left) and SPME LC Tips (right) devices.

CONCLUSIONS

Both methodologies showed to be a remarkable alternative, since it is cost-effective, user- and eco-friendly, requiring low volume of sample.

Results in aqueous matrix indicate that BAμE devices have overall better extraction efficiencies (46% to 112%) than SPME LC Tips (1% to 151%).

In 0.5 mL blank urine samples, extraction efficiencies of BAμE were 28% to 103% and low matrix effect.

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

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