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TUNING THE SELECTIVITY OF MOLECULARLY IMPRINTED POLYMERS FOR THE ANALYSIS OF ANTIMICROBIAL RESIDUES BY SPE-HPLC

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The evolution of food production systems from small farming units to large scale intensive production systems has been accompanied by an increasing administration of antimicrobials to food producing animals, to prevent and control the spread of infections in the farm. Fluoroquolone and beta-lactam antibiotics, especially penicillins and cephalosporins (CPs) are among the most used antimicrobials in veterinary practice and their analysis in such complex matrices is usually carried out by liquid chromatography after a solid phase extraction step (SPE) to achieve the required sensitivities. This work describes the preparation of novel molecularly imprinted polymers for their application as solid phase extraction sorbents (MISPE) for multi-residue analysis of beta-lactam and fluoroquinolone antimicrobials in food samples. The use of antimicrobial surrogate molecules has been evaluated for polymer synthesis to avoid target bleeding during MISPE. The polymers were prepared by a non-covalent imprinting approach in the form of monoliths, or as spherical micropaticles using sacrificial silica beads (40-75 µm) to further improve the packing efficiency of SPE cartridges. A combinatorial screening approach has been applied to select the optimal functional monomer and cross-linker formulation for the selected antimicrobial families. The rebinding capactity of the MIP/NIP libraries has been evaluated in batch mode assays by high-performance liquid chromatography (HPLC) with fluorescence (FLD) or diode array (DAD) detection. MISPE conditions (namely, loading, washing and elution solvents and flow rates) have been optimized in each case to allow multi-residue analysis of cephalosphorins, pencilinins or fluoroquinolone [1] antimicrobials in different food matrices. The methods have been validated according to European Union Decision 2002/657/EC in terms of linearity, accuracy, precision, selectivity, decision limit (CCa) and detection capability (CCb) by HPLC-FLD/DAD and HPLC-MS/MS.
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[1] J.L. Urraca, M. Castellari,C.A. Barrios,M.C. Moreno-Bondi, J. Chromat. A. 1343 (2014) 1–9.