

Rapid screening tests for the evaluation of the quality of semisolid pharmaceutical dosage forms

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Abstract

In this thesis, various electrochemical sensors (stochastic, voltammetric, and multimode) were proposed for the determination of active substances frequently found in semi-solid pharmaceutical dosage forms. For this study, a series of molecules from the following drug classes were selected: non-steroidal anti-inflammatory drugs (ibuprofen, ketoprofen, flurbiprofen), antibiotics (fusidic acid, gentamicin), azole antifungals (butoconazole), glucocorticoids (methylprednisolone, betamethasone), capsaicinoids (nonivamide) and vitamin derivatives (calcipotriol). For the qualitative and quantitative analysis of these compounds, 3D carbon paste-based sensors and disposable 2D copy paper-based and screen-printed sensors were developed. Carbon paste-based sensors were modified with compounds such as N-methylfulleropyrrolidine, valinomycin, calix[6]arene, and metal oxides such as ZnO and TiO₂, while paper-deposited sensors were modified with maltodextrin, and screen-printed ones with various types of calixarenes. Different types of matrices were used to test the applicability of these sensors: pharmaceutical dosage forms (gels, creams, ointments, oropharyngeal spray, and tablets) and surface water samples collected from the river. The newly developed sensors demonstrated increased reliability, selectivity, and sensitivity for the determination of selected active substances and can be used for purity tests, content uniformity tests but also for testing these compounds in surface waters, given the fact that they can become pollutants with high risk to the population.