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Highly sensitive determination of serotonin in human urine by 2D capillary electrophoresis with cyclodextrin separation environment and on-line sample pretreatment

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An advanced 2D capillary electrophoresis method based on on-line combination of capillary isotachopheresis and capillary zone electrophoresis with cyclodextrin additive in background electrolyte was developed for effective determination of serotonin in human urine. Hydrodynamically closed separation system and large bore capillaries (300-800 μm) were chosen for the possibility to enhance the sample load capacity, and, by that, to decrease limit of detection. Isotachopheresis served for the sample pre-separation, defined elimination of sample matrix constituents (sample clean-up), and pre-concentration of the analyte. Cyclodextrin separation environment enhanced separation selectivity of capillary zone electrophoresis. In this way, serotonin could be successfully separated from the rest of sample matrix constituents migrating in capillary zone electrophoresis step so that human urine could be directly (i.e. without any external sample preparation) injected into the analyzer. Proposed method was successfully validated, showing favorable parameters of sensitivity (detection limit for serotonin was 2.32 ng mL⁻¹), linearity (regression coefficient higher than 0.99), precision (repeatability of the migration time and peak area were in the range of 0.02-1.17% and 5.25-7.88%, respectively), and recovery (ranging in the interval of 90.0-93.6%). The developed method was applied for the assay of the human urine samples obtained from healthy volunteers. The determined concentrations of serotonin in such samples were in the range of 12.4-491.2 ng mL⁻¹ that was in good agreement with literature data. This advanced method represents highly effective, reliable and low cost alternative for the routine determination of serotonin as a biomarker in human urine.

Biography

Peter Mikuš has completed his PhD from Comenius University. He is a Researcher, University Teacher, Professor in Pharmaceutical Chemistry since 2017, Director of the Toxicological and Antidoping Center at the Faculty of Pharmacy Comenius University in Bratislava (FPCU) and Head of the Department of Pharmaceutical Analysis and Nuclear Pharmacy FPCU. His research team is focused on the development, validation and application of advanced hyphenated analytical methods, based on a combination of 2D-separation and spectral (UV-VIS, MS/MS) techniques, for pharmaceutical and biomedical research. He has published more than 80 papers in reputed CC journals with hundreds of citations.

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