

Biotechnology Congress 2018: Paper spray tandem mass spectrometry: Applications to drugs determination in body fluids

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Abstract

Forensic science aims to identify the origin cause of a death or a crime, or evaluate the human behavior, generally applied to traffic safety and the operation of a motor vehicle, as well as to doping in sport, or to demonstrate an analysis of body fluids such as urine, blood and oral fluid (OF). Forensic toxicology has been applied in the elucidation of issues that occur in legal proceedings related to intoxications. It is important to choose the appropriate matrix for the purpose in cases where drugs of abuse are investigated. The OF and urine matrix including easy and non-invasiveness collection. OF is an indicator of recent drug intake and closer relationship to plasma free-drug concentrations than urine and the collection procedures can be done on-site under close supervision. The drug analysis in non-conventional biological fluids, such as OF and urine, is attracting interest due to recent legislation changes in Brazil and a greater police surveillance. However, complex matrix samples have a large amount of endogenous, exogenous and other interfering compounds. In this way, sample preparation is an important tool for rapid and sensitive analytical methods. Paper spray ionization (PSI) has emerged as an ambient ionization method for analysis in mass spectrometry (MS). This source has an easy operation, rapid analysis, low cost and it has demonstrated great potential in forensic science, but PS performance is dependent on the surface properties of the substrate (paper). Paper modified with graphene oxide (GO-paper) was applied for creatinine analysis in urine samples. The PSI-GO/MS method showed acceptable linearity (0.1-100.0 ppm) with R² values greater than 0.991. Precision values were between 1.1 to 6.8% and accuracy above 96.8%. Restricted access materials (RAM) are able to exclusion of endogenous compounds and extraction of analytes in just one step. So, another methodology was applied with internal surface reversed phase (ISR- RAM) on the paper for proteins exclusion in complex samples by MS analysis. Catecholamines and antidepressants were identified by ISR- RAM/ MS with 98.9% of protein exclusion, linear range in 10.0-1000.0 ppb, precision values lower 15%, accuracy and recoveries between 85.6 and 101.9%. Another way to apply PSI-MS was with molecularly imprinted polymers (MIP) synthesized directly on the paper surface (cellulose membrane) for cocaine analysis. The membrane containing MIP was selective and had a greater signal intensity than chromatographic paper and non-imprinted polymers (NIP) by PSI-MS. MIP-PSI method was acceptable linearity (1-100 ppb) with R² values greater than 0.998. The methods showed accuracy and precision values below 15%, recoveries above 80%. The use of conductive polymers (CP) as a substrate in PSI-MS has applied some pharmaceuticals, abuse drugs and adulterants, metabolites and CP-paper showed higher absolute intensity signal compared to the conventional filter paper. The linearity and performance of CP-coated papers were demonstrated for a range of analytes, proving that CP-coated papers are alternative for use in the qualitative and quantitative analysis. In addition, the results were promising and analysis time by classical methods, such as liquid chromatography (LC-MS). All techniques were standardized and validated according to ANVISA's normative.

Biography

Heloa Santos has completed his Ph.D. in Chemistry at the age of 29 years from University of Espírito Santo (UFES, Brazil) and she had a split Ph.D. for one year at the department of forensic and investigative science in West Virginia University (WVU, US). She is postdoctoral research in Dr. Chaves's group from the University of Goiás (UFG, Brazil). She worked with ambient ionization sources, such as paper spray ionization mass spectrometry (PSI-MS) and direct analysis in real time mass spectrometry (DART-MS). She has experience in body fluids analysis and method validation in forensic science. She has published 10 papers in reputed journals

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