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Abstracts

Section 6 - Pharmaceutical Analysis

PBA1

OPTIMIZATION OF THE CE-MS METHOD FOR THE SIMULTANEOUS ANALYSIS OF NSAIDS AND BOSWELLIC ACIDS

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The presented CE-MS method is designed to separate boswellic acids along with 13 nonsteroidal anti-inflammatory drugs which are recognized as potential adulterants of dietary supplements intended for managing chronic inflammatory conditions, where *Boswellia serrata* extract serves as a key active component. The CE-MS experiments were conducted on Agilent 7100 CE system coupled with Agilent 6495 QqQ mass spectrometer equipped with Agilent Jet Stream ion source. The separation was achieved in 76 cm fused silica capillary with an applied voltage of +27 kV at 25 °C, utilizing a background electrolyte composed of 40 mmol/L ammonium acetate (pH 8.5), MeOH, and ACN (5:1:4, v/v/v). The analysis was conducted in negative ion mode using selected reaction monitoring with two transitions of analysed compounds, provided they showed sufficient fragmentation. Acceptable selectivity was achieved for all tested NSAIDs and boswellic acids, except for unresolved α- and β-isomers. In the optimization phase, ion source parameters and sheath liquid composition were systematically fine-tuned to enhance sensitivity and extend the separation capillary's lifetime. However, further research was needed to improve method precision. The main focus was put on the study of the effects of nebulising pressure, sheath liquid composition and flow rate, and sample injection time on the method precision and sensitivity. Afterwards, the potential of multisegment injection analysis to increase the method precision and throughput was examined as well.

The study was supported by the GA UK project No. 214123 and the project of specific research SVV 260662.

PBA2

THE ROLE OF SUPPORTED LIQUID EXTRACTION IN TARGETED STEROID PROFILING IN MICE PLASMA

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The development of the sample preparation method is an integral part of steroid analysis. Liquid-liquid extraction (LLE) belongs among the top three methods commonly used in steroidomic profiling. That is due to steroids' low molecular weight, lipophilicity, and structural similarity. Supported liquid extraction (SLE), based on the LLE principle, uses a chemically inert, high-surface-area diatomaceous earth. An aqueous sample is loaded onto the inert support, and an immiscible organic solvent is passed over the inert material, extracting analytes without matrix polar interferences. Positive pressure and gravity are used to allow i) the adsorption of the sample to the surface area and ii) the elution of the extract from the SLE cartridge. Using a positive pressure manifold enables, in contrast to a vacuum manifold, to improve the adsorption of viscous samples, reduce sample contamination (N_2 cylinders; higher purity over the air), achieve greater method recovery and reproducibility, and reduce variability.

In this study, we aimed to optimize and validate a high-throughput SLE method for targeted profiling of 38 steroids in mouse plasma while comparing the performance of analog and semi-automated positive pressure manifolds in terms of reproducibility and variability.

Sample loading volumes, protein binding disruption, selection of extraction solvent, and volumes of extraction solvent were optimized during the development of the final SLE method using the semi-automated Otto SPEcialist positive pressure manifold. The same SLE protocol was later used on the analog positive pressure manifold. Steroids in mouse plasma were analyzed using a previously optimized RP-UHPLC-MS/MS method. The SLE-UHPLC-MS/MS method was validated according to EMA/ICH guidelines on bioanalytical method validation and study sample analysis.

The study was supported by the GA UK project No. 348221 and the project of specific research SVV 260662.

PBA3

COMPLEX SCREENING OF RETENTION BEHAVIOUR OF CATECHOLAMINES

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Nowadays, due to the recently discovered mechanisms influencing the level of serotonin in placental tissue during pregnancy [1], new questions arise, whether concentration changes of another important neurotransmitters do not affect foetal development too. Information about production of catecholamines (dopamine (DA), norepinephrine (NE) and epinephrine (E)) by placenta is known, however there is not fully explored and clarified information about ability of placenta to regulate foetal development through these neurotransmitters.

Despite many published methods, the determination of catecholamines is still a challenge due to their chemical nature and low concentrations in complex biological materials [2], which we proved by our screening of retention behaviour. In reversed phase mode the retention is low. Under HILIC conditions high retention but with peak broadening was observed and, in both modes, separation of mentioned compounds is quite hard to achieve. Moreover, detection of catecholamines and their precursor compounds is limited because of low concentration levels in biological materials.

Modification with some suitable derivatization reagent seems to be a solution that promises higher retention and better separation of products with lower detection limits [3]. As part of the development of an HPLC method for the determination of catecholamines in placental tissue, the comparison of different derivatization agents used for derivatization of tyrosine, *L*-DOPA, dopamine, noradrenaline, and adrenaline is presented.

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PBA4

QUALITY CONTROL OF TRIBULUS TERRESTRIS FOOD SUPPLEMENTS USING VALIDATED UHPLC-CAD METHOD

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The aim of the study was to develop and validate a new UHPLC method with CAD (charged-aerosol detection) for simultaneous determination of steroidal saponins in food supplements supporting sexual potency based on *Tribulus terrestris* extracts, such as dioscin, diosgenin, protodioscin, pseudoprotodioscin, gitogenin, gracillin, tribulosin, sarsasapogenin and ruscogenin. The validated UHPLC method was used for determination of active ingredients in food supplements - Afroditky Plus (FYTOPHARMA), ALIVER Tribulus (ALIVER nutraceuticals spol. s.r.o.), Menactive (ADVANCE nutraceuticals, s.r.o.), ALAVIS Maxima Bestier (Patron ca, s.r.o.), Allnature Kotvičník (Allnature, s.r.o.), Dr. Popov Kotvičník (Dr. Popov, s.r.o.), ADIEL Kotvičník zemní (Ing. Stanislav Kameníček), Clavin (Simply You Pharmaceuticals), Arginmax (Simply You Pharmaceuticals), 3BULLUS (Dr. Max), Primulus (Primulus Group) and Tribul (ADVANCE). The analysis was performed on the Kinetex® Phenyl-Hexyl (100 × 4.6 mm; 2.6 μm) chromatography column using gradient elution program at flow rate of 1.0 ml min^{-1} with mobile phase consisting of acetonitrile and 0.1% formic acid solution, at the temperature of 15°C. The validation parameters were evaluated.

Extracts were prepared from the samples of the food supplements using the mixture of acetonitrile, ethanol, and ultrapure water (2:6:3, *v/v/v*), sonicated 10 minutes, and filtrated through 0.22 μm PTFE filter. Subsequently, the content of active substances in the commercially available food supplements was evaluated and the quality of individual producers was critically compared.

Keywords: Tribulus terrestris; Steroidal saponins; UHPLC; CAD; Phenyl-Hexyl column; Food supplements

PBA5

MINIATURIZED SAMPLE PREPARATION: ELECTROMEMBRANE EXTRACTION AND VOLUMETRIC ABSORPTIVE MICROSAMPLING

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Volumetric Absorptive Microsampling (VAMS) facilitates repeated blood collection from a single animal, minimizing overall animal use in preclinical studies. VAMS devices stand out by relying less on hematocrit, elevating precision, and making sample collection more straightforward than conventional dried blood spots. [1] Electromembrane extraction (EME) is a relatively new extraction technique based on hollow fiber microextraction. The application of direct current voltage in EME accelerates analyte isolation, leading to increased recoveries within a shorter time, and it also facilitates the use of a 96-well format. [2]

This study aimed to establish a methodology for assay of doxorubicin (DOX) and its metabolite, doxorubicinol (DOXol), from blood absorbed into VAMS tips using EME followed by UHPLC-MS/MS analysis. The primary focus was on optimizing sample preparation. Various EME parameters (supported liquid membranes, voltage, time, donor and acceptor solutions) were systematically explored to attain optimal recovery. After optimalization, the method was fully validated. Additionally, protein precipitation, as a reference extraction method, was developed and compared to EME. The method's applicability was confirmed by analyzing VAMS samples taken after DOX administration in pharmacokinetic studies involving mice and rabbits.

The study was supported by Charles University (GAUK 232223 and SVV 260547).

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PBA6

TWO-DIMENSIONAL SAX×RP LIQUID CHROMATOGRAPHY FOR ANALYSIS OF COMPLEX PROTEOMIC SAMPLES

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Liquid chromatography coupled with mass spectrometry (LC-MS) represents a core approach to characterizing complex peptide samples in bottom-up proteomics. Such analyses are typically performed at elevated column temperatures to improve LC separation. However, along with long in-column residence times, peptides undergo degradation, reducing the quality of LC-MS data. Online comprehensive two-dimensional LC (LC×LC) is a promising approach to address this issue because the in-column residence time of peptides is drastically reduced in the 2nd-D separation. Hence, we seek to develop online LC×LC of peptides by strong anion exchange (SAX) at high pH and their traping at room temperature, followed by a series of fast reversed-phase (RP) gradients at low pH, simultaneously taking advantage of high column temperature. Within the first phase of the study, we focused on optimizing mobile phase composition for SAX 1st-dimension separation in a 2.1 mm inner diameter column. The optimum peptide fractionation has been achieved at a flow rate of 200 µl/min using a gradient of mobile phase constituted formed by 20 mM ammonium hydroxide as component A and 200 mM ammonium formate, pH 4 as component B. Because of the absence of non-volatile salts in the SAX mobile phase, our LC×LC method is expected to be MS-friendly. RPLC was carried out using a column with a unique inner diameter of 1.5 mm, representing a compromise between the sensitivity of 1.0 mm columns and the chromatographic performance of 2.1 mm columns. The mobile phase, comprised of water and acetonitrile, was standard for LC-MS proteomic analyses, both acidified with 0.1% formic acid. The method has been tested using tryptic peptides of trastuzumab. The conditions facilitated an adequate run time of 30 minutes, including full re-equilibration of the whole chromatographic system.

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PBA7

IMPLEMENTING 1.5 MM INNER DIAMETER COLUMNS INTO LC-MS BOTTOM-UP PROTEOMIC WORKFLOWS

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With an increased sensitivity of the mass spectrometers, microbore, and narrow bore columns are gaining popularity for LC-MS bottom-up proteomic applications where robustness and high sample throughput are preferred over absolute sensitivity. In 2018, Lenčo and colleagues demonstrated that 1.0 mm microbore columns could effectively replace conventional nanoflow columns in many proteomic applications with only a modest fivefold increase in the required peptide sample.[1] Since then, analytical columns with a 1.0 mm inner diameter have been considered a default choice for microflow LC-MS-based proteomic analyses. However, columns with an inner diameter of 1.0 mm can inherently not provide the separation performance typically seen for 2.1 mm columns because they suffer from significant trans-column eddy dispersion and are sensitive to extra-column peak broadening. Both effects are significantly reduced in the recently introduced column with an untypical inner diameter of 1.5 mm. A systemic comparison of separation columns with 1.0mm and 1.5mm inner diameters for LC-MS bottom-up proteomic experiments has not been reported yet. We evaluated both the separation columns in terms of sensitivity, analysis throughput, and separation efficiency. The results from the study demonstrate that columns with an inner diameter of 1.5 mm potentially represent a reasonable balance between sensitivity and chromatographic performance and can be preferred for LC-MS bottom-up proteomic workflows if sample amount is not a constraint.

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PBA8

UNRAVELING ALKALOID PROFILES IN DIVERSE BARBERRY SPECIES‘: UHPLC-HRMS AMPLIFIED BY WEAK CATION MIXED-MODE SOLID PHASE EXTRACTION

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The plant kingdom harbors numerous types of alkaloids, each possessing diverse biological properties that offer various benefits to humans. Building on recent investigations, our study focuses on exploring isoquinoline alkaloids of the genus *Berberis* L. (Berberidaceae). Notably, some of these compounds have displayed promising effectivity against the SARS-CoV-2 spike protein in pseudovirus neutralization assay. Our research aims to examine and clarify the phytochemical composition of isoquinoline alkaloids, emphasizing both their diverse structures and quantitative variations within this genus. Our investigation focused on the development of an analytical methodology for the comprehensive profiling of 22 isoquinoline alkaloids utilizing UHPLC-HRMS with the qTOF platform. Throughout the method optimization, we screened various stationary phases (BEH C18, CSH C18, Biphenyl, ACE C18-PFP) and tested various compositions of mobile phases, including organic components (ACN, MeOH) and water components such as 10 mM ammonium formate at pH 3, 4, 5, 9, formic acid 0.02%, 0.1%, 0.5% and ammonium hydroxide 0.02%, 0.1%, 0.5 %. To tackle sample preparation, we developed an SPE method based on weak cation mixed-mode polymeric sorbent to eliminate unwanted acidic and neutral metabolites from barberry crude extract, thereby enhancing the UHPLC-HRMS performance. Our comprehensive methodology was successfully used for non-targeted UHPLC-DIA-HRMS analysis of four distinct barberry species.

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PBA9

IN-SYRINGE AUTOMATED DISPERSIVE SOLID PHASE EXTRACTION OF SELECTED ALKYL-PHENOLS COUPLED ONLINE TO HPLC

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An overview of developing an automated method for the preconcentration of selected alkylphenols, namely octylphenol, heptylphenol, and nonylphenol, in water samples will be given. The method was based on solvent-assisted dispersive micro-solid phase extraction, which was automated via the flow-batch technique Lab-In-Syringe (LIS)[1] and coupled online to HPLC equipped with diode array detection. Iron (iii) thenoyltrifluoroacetonate complex[2], was used as a novel dissolvable sorbent. A small volume of pre-dissolved sorbent was dispersed in the sample solution inside the void of an automatic syringe pump upon which it precipitated and yielded a solid nanostructured sorbent. The extraction occurred by analyte adsorption within 40 s, which was accelerated by in-syringe magnetic stirring. Then, the sample was discharged while the sorbent including analytes was retained on a filter inserted in the syringe inlet. Afterwards, the sorbent was dissolved together with the analytes using a methanolic eluent, that subsequently was directly injected to HPLC. Parameters influencing the method including the extraction pH, amount of sorbent, stirring rate, sample volume, extraction time, eluent volume, and transfer volume to HPLC were optimized. Moreover, the HPLC method was optimized to obtain baseline separation of the listed analytes and sorbent components and validated. Under optimum conditions, linear dynamic ranges were confirmed from 10 μg L^{-1} to 1000 μg L^{-1} (R^2 > 0.997) with limits of detection (LOD) ranging from 3.6 μg L^{-1} to 9.2 μg L^{-1}. The preliminary evaluation of applicability of the developed procedure for the determination of the selected alkylphenols in water samples will be presented.

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PBA10

ADVANCED EXTRACTION APPROACHES BASED ON NANOFIBERS AS SORBENT MATERIALS FOR EXTRACTION OF ENVIRONMENTAL CONTAMINANTS

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Nanofibers can provide an excellent preconcentration of trace-level contaminants, due to their high porosity and large surface to volume ratio.[1] They can be functionalized or combined with other materials to design sorbents providing better selectivity and stability.[2] Here, we propose a simple method to enhance the extraction capacity of nanofibrous discs. It involves adding a small volume of octanol right before the extraction. This novel Supported Liquid Extraction approach was tested to extract 9 common water contaminants with wide range of log P values (1,9 – 6,5). Three different nanofibrous polymers (polyacrylonitrile (PAN), polyhydroxybutyrate (PHB), and polylactic acid (PLA)) were chosen as a sorptive phases. Nanofiber mats were fabricated by the alternating current electrospinning technique and cut into small discs. Extraction experiments were conducted in a beaker, with nanofiber discs attached to a metal rod as a home-made spinning device. After the extraction, desorption was performed in a one-step, directly in HPLC vial. This approach limits manual operations, thus reducing the human error. Addition of octanol showed even a 20-fold increase of enrichment factor when compared to the native discs. The developed method was applied to real river water samples and showed good recovery (58.9 – 121.4 %), repeatability (RSD<13%), and linearity in a range 20-200 mg L^{-1}.

The study was supported by the Czech Science Foundation through the project No. 23-05586S and project SVV 260 662.

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PBA11

LAB-IN-SYRINGE METHOD FOR LOW-ABUNDANT PROTEIN PRECONCENTRATION FROM LARGE SAMPLE VOLUME

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The system LIS is a versatile tool that is based on an automatic computer-controlled syringe pump combined with multiple valve ports. The advantages of this setup are in size-adaptability, easy transfer of various fluids and their mixing using a magnetic stirring bar[1]. In such a system, using of magnetic beads for various purposes is highly beneficial. In previous work, we proved that the LIS is suitable for highly reproducible bioconjugation (98%) of magnetic beads with antibodies in such a low amount as 0.2 mg that was performed in a 1 mL syringe. In this study, two major goals were accomplished. The first was upscaling of the method for magnetic beads coating from a 1 ml to a 5 ml syringe. The 5 mL syringe had double-width compared to the 1 mL syringe, therefore different shapes, sizes, and strengths of magnetic stirring bars were utilized. Also the fluid control evinced differences, thus the program for magnetic beads bioconjugation was modified. Using a 5 mL syringe system we were able to prepare 20 mg of magnetic bead bioconjugate with antibody in one run. The second goal was the automated preconcentration of a low-abundant protein from a large volume. We programed method for the protein preconcentration and the method was tested with human IgG protein. This part of the research is still ongoing therefore preliminary results will be presented.

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PITFALLS IN LC-MS ANALYSIS OF LIPID PEROXIDATION PRODUCTS

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Oxidative stress (OS) plays a crucial role in numerous pathological conditions and is linked to the toxicity mechanisms of a variety of xenobiotics. Despite the ongoing search for the "ideal" biomarker, LC-MS based techniques have emerged as the method of choice for their determination. Within this context, the products of lipid peroxidation stand out as a highly significant class of OS biomarkers. While the secondary lipid peroxidation product malondialdehyde (MDA) has long been recognized as a robust biomarker in plasma and urine, recent advancements in methodology have opened new areas for its application. However, challenges persist, especially those related to matrix effects, which can significantly impact the sensitivity and reliability of MDA measurements in more complex biological matrices.[1] Primary lipid hydroperoxides, such as oxidized cardiolipins, emerge as promising markers for oxidative stress due to their structural characteristics (high abundance of polyunsaturated fatty acids) and proximity to primary sources of ROS in mitochondria. Despite their potential, the development of LC-MS methods for the determination of oxidized cardiolipins faces obstacles coming from the lack of commercially available standards, issues related to their purity and stability. Advancements in these areas promise to enhance our understanding of OS dynamics and pave the way for more effective diagnostic and therapeutic interventions.

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ISOLATION AND DETERMINATION OF ALPHA- AND BETA-BITTER ACIDS IN HOPS AND NUTRACEUTICALS

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Humulus lupulus has a long history of being used as a medicinal plant. Numerous phytochemical constituents and secondary metabolites of the hops extract have been studied for their potential therapeutic and cosmetic use. It is most importantly suggested to help alleviate anxiety and insomnia[1]. In Chinese medicine, hops are used to treat insomnia, diarrhoea, and lack of appetite. In addition, alcoholic extracts of the plant have been used to treat tuberculosis, leprosy, and dysentery in the past[2]. In the last decade, a wide range of pharmacological studies have been conducted on the use of individual hop components. These studies were aimed at producing scientific proof of its traditional use. The effects of the plant on the central nervous system have been studied repeatedly in laboratory animals. However, the results of the studies are sometimes contradictory. *In vivo* studies in rats have shown that the extract of hops containing alpha acids have mainly sedative effects and the beta acids show antidepressant activity[3]. A wide range of nutraceuticals contain hop extract in various amounts. It can also be found in different dosage forms. However, the amount of bitter acids is not mentioned in any of the supplements. To obtain standards of bitter acids, hop pellets were extracted with the use of LLE, preparative LC-MS and fractions were monitored by HPTLC and GC-MS. To elucidate the concentration of bitter acids a method for the monitoring was developed, optimised, and tested on commercially available nutritional supplements.

The study was supported by project SVV 260 662

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PBA14

COMPREHENSIVE TWO-STEP SUPERCRITICAL FLUID EXTRACTION FOR THE ISOLATION OF BIOACTIVE COMPOUNDS FROM PLANTS

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Extraction and isolation of compounds with different chemical properties from complex matrices is a key part of plant analysis. It typically requires multiple steps, large volumes of organic solvents, including harmful and toxic ones, and manual intervention.

We suggested a comprehensive supercritical fluid extraction (SFE) using a mixture of carbon dioxide, ethanol, and water as an extraction solvent to isolate nonpolar volatiles, flavonoids, phenolic acids, and terpenoic acids. During the method optimization, the composition of the extraction solvent, including ethanol amount (2 – 95%), water addition (0 – 20%), extraction temperature (40 – 80 °C), and pressure (100 – 320 bar) were optimized as key extraction parameters for each group of analytes using the experimental design. The final SFE method combined two consecutive steps. The first extraction step aimed only at volatile compounds extracted in 20 minutes using only 2 % of ethanolic cosolvent in CO_2. After the automatic switching of conditions, resulting in the cosolvent volume increase of up to 44 vol%, flavonoids, and phenolic acids were extracted in 60 min. The novel method was verified in terms of extraction efficiency, selectivity for selected groups of analytes, extraction repeatability, accuracy, precision, and greenness. The holistic SFE was applied to seven plant species characterized by different profiles of volatile terpenes and phenolics. The results proved that this proof-of-concept SFE is suitable for extracting complex plant samples. Moreover, the novel approach decreases the consumption of harmful solvents and extraction time and avoids manual intervention between individual extraction steps.

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PBA15

SUPERCRITICAL FLUID CHROMATOGRAPHY-MULTIMODAL IONIZATION-TANDEM MASS SPECTROMETRY AS A UNIVERSAL TOOL FOR ANALYSIS OF PLANT EXTRACTS

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Complex analysis of plant extracts usually requires a combination of several analytical approaches. Nonpolar molecules, including terpenes and other volatiles, are usually separated using gas chromatography. On the other hand, liquid chromatography is widely used in the analysis of various more polar compounds, such as flavonoids, alkaloids, carotenoids, due to the availability of large number of stationary phases and chromatographic modes. Current methods reported in the literature typically require a labor-intensive combination of liquid and gas chromatography for analysis of the whole spectrum of compounds in plant extracts. Therefore, in this study, we developed a holistic two-injection approach for plant extract analysis, which is carried out within one instrument without the need for any manual intervention during the analysis.

During the optimization of the supercritical fluid chromatography (SFC), 9 stationary phases were tested as well as 4 organic modifiers and various temperatures, pressures, gradient programs and analysis times. Moreover, 3 different ion sources were compared, including electrospray (ESI), atmospheric pressure chemical ionization (APCI), ESI-based UniSpray, and multimodal source combining ESI and APCI (ESCi). Finally, the analysis of 17 volatile terpenes was carried out on a porous graphitic carbon column within 7.5 min followed by analysis on short diol column where flavonoids and phenolic and terpenoic acids were analyzed within 15.5 min. An ESCi ionization source was selected for the mass spectrometry detection as simultaneous ionization of both lipophilic and polar compounds was required. The quantitative aspects of the final UHPSFC-ESI/ESCi-MS/MS two-injection approach were determined, and it was applied to the analysis of *Eucalyptus* sp. extracts prepared by supercritical fluid extraction.

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OPTIMIZATION OF SAMPLE PREPARATION FOR THE UHPLC-MS/MS DETERMINATION OF OCHRATOXINS IN URINE

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Ochratoxins, nephrotoxic mycotoxins associated with a risk of kidney tumors, are produced by microscopic fungi of the genera *Aspergillus* and *Penicillium.* These toxins commonly contaminate various foodstuffs, including cereals, coffee beans, dried fruits, and wine.[1] Biomonitoring, involving the analysis of parent compounds and their metabolites in biological fluids, is a valuable tool for investigating human exposure to mycotoxins.[2] Urine is the body fluid most often used to measure mycotoxin exposure due to its easy and non-invasive collection. Besides the parent compounds ochratoxin A, B, and C, the metabolite ochratoxin-alpha is often found in urine.[3]

To detect low levels of ochratoxins in urine, a highly sensitive and selective analytical method is crucial. For this purpose, we employed ultra-high-performance liquid chromatography coupled with tandem mass spectrometry (UHPLC-MS/MS). Within the development of sample preparation, various techniques were tested, including supported liquid extraction (SLE), micro-solid phase extraction in pipette tips (μ-SPE-PT), and salting-out assisted liquid/liquid extraction (SALLE). Among them, μ-SPE-PT was chosen as the optimal choice, demonstrating the greatest potential for sample clean-up and concentration.

Several chemistries of the μ-SPE-PT stationary phase have been tested: C18, HLB (hydrophilic-lipophilic balance), and AX (anion exchange), with HLB and AX showing promising results. For these two SPE sorbents, loading, washing, and elution steps were optimized to achieve good recoveries for all the analytes. The best results were obtained with the HLB stationary phase with a 70% ACN elution solvent. The extraction recoveries of the final method ranged from 70 to 120% at the spiking level of 1 ng ml^{-1} urine.

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SCREENING OF POLYMER NANOFIBERS AND THEIR MODIFICATIONS

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Novel extraction sorbents represent the best strategy to improve selectivity and extraction efficiency. Therefore, we modify polymer nanofibers via the preparation of copolymers, composites of different fibers, hybridization with carbon materials, and surface modifications to alter their mechanical properties and selectivity. The main aim of this study was a screening of various advanced nanofibrous polymers as extraction sorbents in terms of their selectivity and extraction efficiency for the selected analytes because the shift in retentivity depends on the chemical properties governed by the surface modifications of the fibrous sorbents. For example, coating with polyphenolic compounds, e.g., dopamine, increases the selectivity for polar compounds and water-wettability of the fibers.[1,2]

We also observed that advanced modifications of the polycaprolactone nanofibers increased retention of highly lipophilic analytes due to both hydrophobicity and electronegativity effects: coating with graphene oxide or co-fabrication with polyvinylidene difluoride (PCL/PVDF). A fully automated SPE-HPLC method using the PCL/PVDF fibers was optimized and validated for the extraction of persistent halogenated pesticides from river water with recoveries of 92-108% and repeatability of determination including the online SPE step of better than 3.2%.

All the above-mentioned approaches of modifications spread the splendid potential of novel variations and improvement in nanofiber properties.

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PHYSICOCHEMICAL CHARACTERIZATION AND COMPATIBILITY STUDY OF LENVATINIB MESYLATE WITH EXCIPIENTS BY DIFFERENT ANALYTICAL TECHNIQUES

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The aim of this work was to evaluate the quantitative characterization and pharmaceutical compatibility study of Lenvatinib Mesylate (LEN) with the commonly used excipients for solid and liquid dosage form employing thermogravimetric analysis, differential scanning calorimetry, isothermal stress testing (IST) by HPLC, and Fourier transform infrared spectroscopy to contribute to the interpretation of the obtained results.[1] The selected excipients were magnesium stearate (MS), sodium starch glycolate (SSG), croscarmellose sodium (CCS), pregelatinized starch (PS), microcrystalline cellulose (MCC), pluronic acid (PA), stearic acid (SA), and sodium taurocholate (ST). On the basis of the DSC results, some interactions were found between LEN–CCS, LEN–MCC, LEN–MS, LEN–SSG, LEN–PS, LEN–PA, and LEN–SA, LEN–ST. However, during IST studies less than 10 % change in LEN content was observed in all stressed binary mixtures stored at 50 ℃ except of LEN–PA, LEN–SA and LEN–ST which showed incompatibility with LEN. These results would be suitable for the formulation development of the solid and liquid dosage forms of LEN and further stability studies.

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