

Research/art/teacher profile of a person

Name and surname	prof. RNDr. Peter Mikuš, PhD.
Document type:	Research/art/teacher profile of a person
The name of the university	Comenius University Bratislava
The seat of the university	Šafárikovo námestie 6, 818 06 Bratislava
The name of the faculty	Faculty of Pharmacy
The seat of the faculty	Odbojárov 10, 832 32 Bratislava

I. - Basic information

I.1 - Surname	Mikuš
I.2 - Name	Peter
I.3 - Degrees	prof., RNDr. PhD.
I.4 - Year of birth	1972
I.5 - Name of the workplace	Department of Pharmaceutical Analysis and Nuclear Pharmacy, Faculty of Pharmacy, Comenius University in Bratislava
I.6 - Address of the workplace	Odbojárov 10, 83232 Bratislava
I.7 - Position	University Professor, Head of Department
I.8 - E-mail address	mikus@fpharm.uniba.sk
I.10 - Name of the study field in which a person works at the university	Pharmaceutical Chemistry
I.11 - ORCID iD	https://orcid.org/0000-0001-5755-9970

II. - Higher education and further qualification growth

II.1 - First degree of higher education

II.a - Name of the university or institution	Faculty of Natural Sciences, Comenius University in Bratislava
II.b - Year	1995 (spojené)
II.c - Study field and programme	Analytical Chemistry

II.2 - Second degree of higher education

II.a - Name of the university or institution	Faculty of Natural Sciences, Comenius University in Bratislava
II.b - Year	1995
II.c - Study field and programme	Analytical Chemistry

II.3 - Third degree of higher education

II.a - Name of the university or institution	Faculty of Natural Sciences, Comenius University in Bratislava
II.b - Year	2001
II.c - Study field and programme	Analytical Chemistry

II.4 - Associate professor

II.a - Name of the university or institution	Faculty of Pharmacy, Comenius University in Bratislava
II.b - Year	2007
II.c - Study field and programme	Pharmaceutical Chemistry

II.5 - Professor

II.a - Name of the university or institution	Faculty of Pharmacy, Charles University in Prague
II.b - Year	2017
II.c - Study field and programme	Pharmaceutical Chemistry

II.6 - Doctor of Science (DrSc.)

III. - Current and previous employment

III.a - Occupation-position	III.b - Institution	III.c - Duration
University teacher (assistant professor, associate professor, professor)	Faculty of Pharmacy, Comenius University in Bratislava	2001-presentence

V. - Overview of activities within the teaching career at the university

V.1 - Overview of the profile courses taught in the current academic year according to study programmes

V.1.a - Name of the profile course	V.1.b - Study programme	V.1.c - Degree	V.1.d - Field of study
Analytical chemistry	Pharmaceutical chemistry	III (PhD.)	Pharmacy
Pharmaceutical chemistry	Pharmaceutical chemistry	III (PhD.)	Pharmacy

V.2 - Overview of the responsibility for the delivery, development and quality assurance of the study programme or its part at the university in the current academic year

V.2.a - Name of the study programme	V.2.b - Degree	V.2.c - Field of study
Pharmaceutical Chemistry	III (PhD.)	Pharmacy

V.3 - Overview of the responsibility for the development and quality of the field of habilitation procedure and inaugural procedure in the current academic year

V.3.a - Name of the field of habilitation procedure and inaugural procedure	V.3.b - Study field to which it is assigned
Pharmaceutical Chemistry	Pharmacy

V.4 - Overview of supervised final theses

V.4.1 - Number of currently supervised theses

V.4.b - Diploma (second degree)	10
V.4.c - Dissertation (third degree)	3

V.4.2 - Number of defended theses

V.4.b - Diploma (second degree)	44
V.4.c - Dissertation (third degree)	8

V.5 - Overview of other courses taught in the current academic year according to study programmes

V.5.a - Name of the course	V.5.b - Study programme	V.5.c - Degree	V.5.d - Field of study
New trends in analytical chemistry	Pharmacy	II (Mgr.)	Pharmacy
Analytical chemistry I	Pharmacy	II (Mgr.)	Pharmacy
Analytical chemistry II	Pharmacy	II (Mgr.)	Pharmacy
Analytical monitoring of drug levels in pharmaceutical practice	Pharmacy	II (Mgr.)	Pharmacy

VI. - Overview of the research/artistic/other outputs	
VI.1 - Overview of the research/artistic/other outputs and the corresponding citations	
VI.1.1 - Number of the research/artistic/other outputs	
VI.1.a - Overall	366
VI.1.b - Over the last six years	148
VI.1.2 - Number of the research/artistic/other outputs registered in the Web of Science or Scopus databases	
VI.1.a - Overall	161
VI.1.b - Over the last six years	74
VI.1.3 - Number of citations corresponding to the research/artistic/other outputs	
VI.1.a - Overall	707
VI.1.b - Over the last six years	152
VI.1.4 - Number of citations registered in the Web of Science or Scopus databases	
VI.1.a - Overall	699
VI.1.b - Over the last six years	151
VI.1.5 - Number of invited lectures at the international, national level	
VI.1.a - Overall	7
VI.1.b - Over the last six years	1
VI.2 - The most significant research/artistic/other outputs	

1

Direct quantitative determination of amlodipine enantiomers in urine samples for pharmacokinetic study using on-line coupled isotachophoresis-capillary zone electrophoresis separation method with diode array detection
By

[Mikus, P](#) (Mikus, Peter)

[Marakova, K](#) (Marakova, Katarina) [Marak, J](#) (Marak, Jozef) [Nemec, I](#) (Nemec, Igor) [Valaskova, I](#) (Valaskova, Iva) [Havranek, E](#) (Havranek, Emil)

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Article

Abstract

The present work illustrates possibilities of column-coupling capillary electrophoresis (CE-CE) combined with chiral selector (2-hydroxypropyl-beta-cyclodextrin. HP-beta-CD) and fiber-based diode array detection (DAD) for the direct quantitative enantioselective determination of trace drug (amlodipine, AML) in biological multicomponent ionic matrices (human urine). Capillary isotachopheresis (ITP) served as an ideal injection technique in CE-CE. Moreover, the ITP provided an effective on-line sample pretreatment prior to the capillary zone electrophoresis (CZE) separation. Enhanced separation selectivity due to the combination of different separation mechanisms (ITP vs. CZE-HP-beta-CD) enabled to obtain pure zones of the analytes, suitable for their detection and quantitation. The DAD, unlike single wavelength UV detection enabled to characterize the purity (i.e. spectral homogeneity) of the analytes zones. A processing of the raw DAD spectra (the background correction and smoothing procedure) was essential when a trace analyte signal was evaluated. Obtained results indicated pure (i.e. spectrally homogeneous) zones of interest confirming effective ITP-CZE separation process. The proposed ITP-CZE-DAD method was characterized by favorable performance parameters (sensitivity, linearity, precision, recovery, accuracy, robustness, selectivity) and successfully applied to an enantioselective pharmacokinetic study of AML. (c) 2008 Elsevier B.V. All rights reserved.

Keywords

Author Keywords

[Isotachopheresis](#)[Capillary zone electrophoresis](#)[Column-coupling electrophoresis](#)[Diode array detection](#)[Chiral drug](#)[Amlodipine enantiomers](#)[Cyclodextrin](#)[Human urine](#)

Keywords Plus

[BETA-CYCLODEXTRIN](#)[CHIRAL SEPARATION](#)[OROTIC-ACID](#)[PRETREATMENT](#)[METABOLISM](#)[RESOLUTION](#)[FLUIDS](#)[DRUGS](#)[SERUM](#)

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Categories/Classification

Research Areas

Biochemistry & Molecular BiologyChemistry

2

Advanced CE for chiral analysis of drugs, metabolites, and biomarkers in biological samples

By

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[Marakova, K](#) (Marakova, Katarina)

Electrophoresis

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Document Type

Review

Abstract

An analysis of recent trends indicates that CE can show real advantages over chromatographic methods in ultratrace enantioselective determination of biologically active compounds in complex biological matrices. It is due to high separation efficiency and many applicable in-capillary electromigration effects in CE (countercurrent migration, stacking effects) enhancing significantly (enantio) separability and enabling effective sample preparation (preconcentration, purification, analyte derivatization). Other possible on-line combinations of CE, such as column coupled CE-CE techniques and implementation of nonelectrophoretic techniques (extraction, membrane filtration, flow injection) into CE, offer additional approaches for highly effective sample preparation and separation. CE matured to a highly flexible and compatible technique enabling its hyphenation with powerful detection systems allowing extremely sensitive detection (e.g. LIF) and/or structural characterization of analytes (e.g. MS). Within the last decade, more as well as less conventional analytical on-line approaches have been effectively utilized in this field and their practical potentialities are demonstrated on many new application examples in this article. Here, three basic areas of (enantioselective) drug bioanalysis are highlighted and supported by a brief theoretical description of each individual approach in a compact review structure (to create integrated view on the topic), including (i) progressive enantioseparation approaches and new

view on the topic), including (i) progressive enantioseparation approaches and new enantioselective agents, (ii) in-capillary sample preparation (preconcentration, purification, derivatization), and (iii) detection possibilities related to enhanced sensitivity and structural characterization.

Keywords

Author Keywords

[Biomedical analysis](#)[CE](#)[Chiral separation](#)[Detection](#)[Sample pretreatment](#)

Keywords Plus

[CAPILLARY-ZONE-ELECTROPHORESIS](#)[LIQUID-PHASE MICROEXTRACTION](#)[IONIZATION-MASS-SPECTROMETRY](#)[SELECTIVE EXHAUSTIVE INJECTION](#)[DYNAMIC PH JUNCTIONS](#)[SULFATED-BETA-CYCLODEXTRINS](#)[INSOLUBLE IONIC POLYMERS](#)[DIODE-ARRAY DETECTION](#)[BOVINE SERUM-ALBUMIN](#)[LABELED AMINO-ACIDS](#)

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Categories/Classification

Research Areas

Biochemistry & Molecular BiologyChemistry

3

Separation possibilities of three-dimensional capillary electrophoresis

By

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[Havranek, E](#) (Havranek, Emil)

Electrophoresis

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Article

Abstract

Separation possibilities of three-dimensional (3D) capillary electrophoresis (CE) were studied in this work. They were demonstrated using phthalic acid as a model analyte and human urine as a complex ionic model matrix. Complexity of the selected problem ordering from several facts, such as (i) analyte present on a trace concentration levels, (ii) analyte present in multicomponent matrix and (iii) analyte migrating in the region of electropherogram in which is naturally present the majority of ionizable organic compounds (i.e. potential interfering compounds). 3D tandem was created by (i) isotachopheresis (ITP) pre-separation stage (first), (ii) ITP analytical stage (second), and (iii) capillary zone electrophoresis (CZE) analytical stage (third). Comparison of 2D and 3D CE employing two and three different CE stages, respectively, revealed considerably enhanced separation capability of the 3D CE system. Although no single ITP was sufficient for the effective sample pretreatment, the mutual combination of these two ITP steps do it. The proposed ITP tandem was based on the different migration pattern of two spacers analyte matrix constituents under different acid-base conditions (pH 3.1 vs. pH 4.5 in ITP1 and ITP2, respectively), that can be, generally, very effective tool for acidic compounds present in multicomponent ionic matrices. Besides the enhanced separation selectivity/sample clean-up, the 3D CE method kept benefits of the hydrodynamically closed separation system with enhanced sample loadability, such as excellent (i) reproducibility of the measurements and (ii) concentration detection limits. Hence, this study clearly demonstrated great potentialities of 3D CE in the solving even the most advanced separation problems as can be found in bioanalytical field. (C) 2012 Elsevier B.V. All rights reserved.

Keywords

Author Keywords

[Hydrodynamically closed mode](#)[Three dimensional capillary electrophoresis](#)[Capillary zone electrophoresis](#)[Isotachopheresis](#)[Phthalic acid](#)[Human urine](#)

Keywords Plus

[DIODE-ARRAY DETECTION](#)[ZONE-ELECTROPHORESIS](#)[LIQUID-CHROMATOGRAPHY](#)[OROTIC-ACID](#)[ISOTACHOPHORESIS](#)[URINES](#)[SAMPLES](#)[SYSTEM](#)[METABOLITES](#)[ENANTIOMERS](#)

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Categories/Classification

Research Areas

Chemistry

Copper compounds in nuclear medicine and oncology

By

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[Melnik, M](#) (Melnik, Milan) [Havranek, E](#) (Havranek, Emil) [Forgacsova, A](#) (Forgacsova, Andrea)

[Mikus, P](#) (Mikus, Peter)

Journal of Coordination Chemistry

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Document Type

Review

Abstract

There have been some notable developments in several areas of inorganic pharmaceuticals that have potentially far-reaching importance for future medical applications and research. One significant development in the field of oncology and hematology is the application of copper complexes. Copper ions play an important role in biological systems, and without their catalytic presence in trace or ultra trace amounts many essential co-factors for biochemical reactions would not take place. Copper is an essential component of several endogenous antioxidant enzymes. Copper affects the transcription of multiple defense and repair genes to protect against metal-induced pathologies. Copper creates stable complexes with a wide variety of organic molecules that can provide required biological affinity and therapeutical activity suitable for targeting specific locations in the body (when using radioactive copper isotopes, Cu-60, Cu-61, Cu-62, Cu-64, Cu-67), as well as non-radioactive copper. The aim of this review is a critical evaluation of copper complexes used for therapy or diagnosis of various diseases in oncology from 2000 to the present.

Keywords

Author Keywords

[Copper complexes](#)[Oncology](#)[Copper homeostasis](#)[Coordination chemistry](#)[Radiopharmaceuticals](#)

Keywords Plus

[ADENOSINE-TRIPHOSPHATASE](#) [ATP7B](#) [TRANSITION-METAL-COMPLEXES](#) [BREAST-CANCER-IN-VITRO](#) [STRUCTURAL-CHARACTERIZATION](#) [COORDINATION CHEMISTRY](#) [ANTIBACTERIAL ACTIVITY](#) [BIOLOGICAL-ACTIVITY](#) [ANTICANCER AGENTS](#) [OXIDATIVE STRESS](#)

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Categories/Classification

Research Areas

Chemistry

5

On-line column coupled isotachophoresis-capillary zone electrophoresis hyphenated with tandem mass spectrometry in drug analysis: Varenicline and its metabolite in human urine By

[Piestansky, J](#) (Piestansky, Juraj)

[Marakova, K](#) (Marakova, Katarina) [Veizerova, L](#) (Veizerova, Lucia) [Galba, J](#) (Galba, Jaroslav)

[Mikus, P](#) (Mikus, Peter)

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Document Type

Article

Abstract

A new highly advanced analytical approach, based on two-dimensional column coupled CE (ITP-CZE) hyphenated with tandem mass spectrometry (MS/MS, here triple quadrupole, QqQ) was developed, evaluated and applied in biomedical field in the present work. Capillary isotachophoresis (ITP) coupled online with capillary zone electrophoresis (CZE) used in hydrodynamically closed separation system was favorable for increasing the sample load capacity, increasing the analyte concentration, and removing the deteriorative highly conductive major matrix constituents. These factors considerably reduced the concentration limits of detection (cLOD) and external sample preparation (comparing to singlecolumn CZE), and, by that, provided favorable conditions for the mass spectrometry (enhanced signal to noise ratio, reproducibility of measurements, working life of MS). Here, the CZE-ESI

combination provided more effective interfacing than ITP-ESI resulting in both a higher obtainable intensity of MS detection signal of the analyte as well as reproducibility of measurements of the analyte's peak area. The optimized ITP-CZE-ESI-QqQ method was successfully evaluated as for its performance parameters (LOD, LOQ, linearity, precision, recovery/accuracy) and applied for the direct identification and ultratrace (pg mL (1)) determination of varenicline and, in addition, identification of its targeted metabolite, 2-hydroxy-varenicline, in unpretreated/diluted human urine. This application example demonstrated the real analytical potential of this new analytical approach and, at the same time, served as currently the most effective routine clinical method for varenicline. (C) 2014 Elsevier B. V. All rights reserved.

Keywords

Author Keywords

[Capillary zone electrophoresis](#)[Capillary isotachopheresis](#)[Hyphenation](#)[Tandem mass spectrometry](#)[Varenicline](#)[Human urine](#)

Keywords Plus

[RECEPTOR PARTIAL AGONIST](#)[DOSE PHARMACOKINETIC](#)[SSMOKING-CESSATION](#)[HUMAN PLASMA](#)

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Categories/Classification

Research Areas

Chemistry

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Categories/Classification

Research Areas

Biochemistry & Molecular BiologyChemistry

VI.3 - The most significant research/artistic/other outputs over the last six years

1

Determination of thiopurine S-methyltransferase activity by hydrophilic interaction liquid chromatography hyphenated

interaction liquid chromatography hyphenated with mass spectrometry

By

[Pecher, D](#) (Pecher, Daniel)

[Dokupilova, S](#) (Dokupilova, Svetlana) [Zelinkova, Z](#) (Zelinkova, Zuzana) [Peppelenbosch, M](#)

(Peppelenbosch, Maikel) [Mikusova, V](#) (Mikusova, Veronika) [Mikus, P](#) (Mikus, Peter)

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Article

Abstract

Thiopurine S-methyltransferase (TPMT) plays an important role in the metabolism of thiopurines used in the therapy of inflammatory bowel diseases (IBD). In this work a new progressive method for the determination of TPMT activity in red blood cells lysates was developed. Analysis was carried out by means of hydrophilic interaction liquid chromatography (HILIC) hyphenated with mass spectrometry (MS). In comparison with reversed-phase high-performance liquid chromatography (RP-HPLC), that has been typically applied in determination of TPMT activity, the HILIC significantly improved the analytical signal provided by MS, shortened analysis time, and improved chromatographic resolution. The HILIC-HPLC-MS method was optimized and validated, providing favorable parameters of detection and quantitation limits (5.5 and 16.5 pmol/mL, respectively), linearity (coefficient of determination 0.9999 in the range of 0.01-1.0 nmol/mL), recovery and precision (93.25-100.37% with RSD 1.06-1.32% in the whole concentration range of QC samples). Moreover, in contrast to the conventional RP-HPLC-UV approach, the complex phenotype TPMT profiles can be reliably and without interferences monitored using the HILIC-HPLC-MS method. Such advanced monitoring can provide valuable detail information on the thiopurines (e.g. evaluating ratio of methylated and non-methylated 6-mercaptopurine) and, by that, TPMT action in biological systems before and during the therapy of IBD. (C) 2017 Elsevier B.V. All rights reserved.

Keywords

Author Keywords

[HILIC-HPLC-Q-TOF MS analysis](#)[Inflammatory bowel diseases](#)[Red blood cell lysates](#)[Thiopurine S-methyltransferase activity](#)[determination](#)

Keywords Plus

[INFLAMMATORY-BOWEL-DISEASE](#)[EFFICIENT SCREENING METHOD](#)[HUMAN ERYTHROCYTE](#)[THERAPY](#)[PHARMACOGENETICS](#)[6-MERCAPTOPURINE](#)[DRUGS](#)[ASSAY](#)[6-THIOGUANINE](#)[POLYMORPHISMS](#)

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Categories/Classification

Research Areas

ChemistryPharmacology & Pharmacy

2

Novel sulfonamides incorporating 1,3,5-triazine and amino acid structural motifs as inhibitors of the physiological carbonic anhydrase isozymes I, II and IV and tumor-associated isozyme IX

By

[Mikus, P](#) (Mikus, Peter)

[Krajciová, D](#) (Krajciová, Dominika) [Mikulova, M](#) (Mikulova, Maria) [Horvath, B](#) (Horvath,

Branislav) [Pecher, D](#) (Pecher, Daniel) [Garaj, V](#) (Garaj, Vladimir) [Bua, S](#) (Bua, Silvia) [Angeli, A](#)

(Angeli, Andrea) [Supuran, CT](#) (Supuran, Claudiu T.)

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Article

Abstract

A new series of thirty s-triazinyl-substituted aminoalkylbenzenesulfonamides, incorporating a symmetric pair of amino acid moieties, is reported, together with inhibition studies of physiologically relevant human carbonic anhydrase (hCA, EC 4.2.1.1) isoforms. Specifically, against the cytosolic hCA I, II, transmembrane hCA IV and the tumor-associated, membrane-bound hCA IX.

The compounds were prepared by nucleophilic substitution of chlorine atoms from cyanuric chloride (2,4,6-trichloro-1,3,5-triazine) using environmentally friendly water-based synthetic conditions. The products yields ranged in the interval of 43-97%. Purity of the products was verified by the HPLC-DAD-ESI-Q-TOF MS method. Identity of the products was confirmed by the same method plus NMR and IR.

The products showed weak inhibition of the cytosolic, off-target isozyme hCA II, but some of them were low nanomolar (i.e. strong) inhibitors of the tumor-associated hCA IX. The series offered representatives selective towards isozymes hCA I, IV and IX. 2,2'4(6-(4-sulfamoylphenethyeamino)-1,3,5-triazine-2,4-diyebis(imino)) disuccinic acid demonstrated highest selectivity to the tumor-associated isoform hCA IX over off-target isozymes, with impressive K-I ratio (hCA II/hCA IX) 213.9 and inhibition constant equal to acetazolamide (K-I = 25.8 nM). Although the selectivities of some other products, e.g. those conjugating Leu and Glu, were a bit lower (188.7 and 84.3, respectively) their inhibition constants were similar to acetazolamide too (24.0 and 27.1, respectively).

The selected most impressive results from the inhibition study were interpreted via molecular modeling experiment (docking in Glide) revealing different inter-molecular enzyme-substrate interaction of 2,2'-((6-((4-sulfamoylphenethyl)amino)-1,3,5-triazine-2,4-diyl)bis(imino))disuccinic acid within specific hCA IX and hCA II microregions. Therefore, several selected compounds from this study can be considered as highly effective and selective inhibitors of hCA IX, worthy to further (preclinical) investigation.

Keywords

Author Keywords

[1,3,5-Triazine](#)[Benzene sulfonamides](#)[Amino acids](#)[Carbonic anhydrase](#)[Enzyme inhibition](#)[Isoform selectivity](#)

Keywords Plus

[DRUG-LIKE MOLECULES](#)[ISOFORMS](#)[ICANCER-THERAPY](#)[EXPRESSION](#)[HYPOXIA](#)[MOIETIES](#)[PROGNOSIS](#)[XIICARCINOMAS](#)[BENZENESULFONAMIDES](#)

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Categories/Classification

Research Areas

3

Novel electrochemical strategy for determination of 6-mercaptopurine using anodically pretreated boron-doped diamond electrode

By

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Abstract

A novel electrochemical approach for 6-mercaptopurine (6-MP) determination employing an anodically pretreated boron-doped diamond electrode (AP-BDDE) is presented herein. The electrode reaction of 6-MP on AP-BDDE (AP achieved by application of +3 V for 180 s in 1 M H₂SO₄) was represented by three well distinguished oxidation peaks at +0.25 V, +1.19 V and +1.63 V (P1-P3) and one reduction peak at +0.11 V (vs. Ag/AgCl/3 M KCl) in Britton-Robinson buffer with pH 2. More detailed study revealed a mixed adsorption and diffusion-controlled reaction mechanism of the analyte. Differential pulse voltammetry (DPV), adapting favorable working conditions found by cyclic voltammetry, was developed for the sensitive determination of 6-MP. A possibility to analyze three baseline separated peaks provided valuable selectivity enhancement of the method. The overall best analytical performance was achieved for the third oxidation peak (P3), which offered the highest sensitivity (30.4 nA/ μ M).

and the widest linear concentration range (1-450 μ M with two independent linear segments, $R^2 = 0.997$). Submicromolar detection limit (0.51 μ M) and intra-day and inter-day repeatability (RSD = 0.38 and 1.91%, respectively) underlined favorable performance of the developed method. The applicability of the proposed method was illustrated by the analysis of pharmaceutical dosages containing 6-MP and spiked human urine, with an excellent average recovery of 101.8% and 95.9%, respectively. Clearly, the combination of an innovative electrode material (BDD) and sensitive voltammetric technique (DPV) established a simple and highly reliable alternative to chemically modified electrodes that might be advantageous in routine pharmaceutical and clinical analysis.

Keywords

Author Keywords

6-mercaptopurine Boron-doped diamond electrode Anodic pretreatment Differential pulse voltammetry Pharmaceuticals Human urine

Keywords Plus

ACUTE LYMPHOBLASTIC-LEUKEMIA RP-HPLC METHOD PASTE ELECTRODES SPECTROPHOTOMETRIC DETERMINATION VOLTAMMETRIC DETERMINATION CARBON NANOTUBES FOLIC-ACID PHARMACEUTICALS 6-THIOGUANINE METABOLITES

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Categories/Classification

Research Areas

Chemistry Electrochemistry

Porous graphitic carbon based chromatography hyphenated with mass spectrometry: A new strategy for profiling thiopurine nucleotides in patients with inflammatory bowel diseases

By

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Abstract

Thiopurine (TP) treatment is discontinued in up to 30% of patients suffering from inflammatory bowel diseases (IBD) due to various adverse effects. Therapeutic drug monitoring of biologically active TP metabolites, i.e. thiopurine nucleotides (TPN), can help to optimize the efficacy and safety of the TP treatment. In our work, a novel strategy for TPN profiling, based on a porous graphitic carbon (PGC) chromatography, was developed. The validated PGC-MS method was compared with ion-exchange LCMS, a currently leading analytical approach established for the determination of TPN. The innovative approach enabled an enhancement of several key performance parameters demanded in a clinical routine use, namely (i) selectivity (time and mass-recognition of all 12 TPN in one run), (ii) sensitivity (2-5-fold increase in intensities of the analytical signals), (iii) sample throughput (25% shorter analysis time). Application of the novel TPN profiling strategy to a pilot clinical study (12 patients) revealed significantly higher levels of 6-methylthioguanine 5'-diphosphate (MeTGDP) in non-responsive IBD patients treated with azathioprine. Some other TPN are very close to the critical level ($p = 0.05$) and they will need larger groups of IBD patients to confirm definitively their relevance. In conclusion, the developed PGC-MS method represents a significant improvement to currently available methods for detailed profiling of TPN and its use in bigger clinical studies should lead to a better understanding of the relationship between TPN profiles and therapeutic outcome. (c) 2020 Elsevier B.V. All rights reserved.

Keywords

Author Keywords

[Inflammatory bowel diseases](#)[Azathioprine](#)[Thiopurine nucleotides](#)[Therapeutic drug monitoring](#)[Porous graphitic carbon based chromatography](#)[Mass spectrometry](#)

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[THERAPY](#)[AZATHIOPRINE](#)[6-MERCAPTOPURINE](#)[ASSOCIATION](#)

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Categories/Classification

Research Areas

Chemistry

5

Advances in Chitosan-Based Nanoparticles for Drug Delivery

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Review

Abstract

Nanoparticles (NPs) have an outstanding position in pharmaceutical, biological, and medical disciplines. Polymeric NPs based on chitosan (CS) can act as excellent drug carriers because of some intrinsic beneficial properties including biocompatibility, biodegradability, non-toxicity, bioactivity, easy preparation, and targeting specificity. Drug transport and release from CS-

based particulate systems depend on the extent of cross-linking, morphology, size, and density of the particulate system, as well as physicochemical properties of the drug. All these aspects have to be considered when developing new CS-based NPs as potential drug delivery systems. This comprehensive review is summarizing and discussing recent advances in CS-based NPs being developed and examined for drug delivery. From this point of view, an enhancement of CS properties by its modification is presented. An enhancement in drug delivery by CS NPs is discussed in detail focusing on (i) a brief summarization of basic characteristics of CS NPs, (ii) a categorization of preparation procedures used for CS NPs involving also recent improvements in production schemes of conventional as well as novel CS NPs, (iii) a categorization and evaluation of CS-based-nanocomposites involving their production schemes with organic polymers and inorganic material, and (iv) very recent implementations of CS NPs and nanocomposites in drug delivery.

Keywords

Author Keywords

[chitosan](#)[nanoparticles](#)[drug delivery](#)[new formulation](#)[targeting](#)[controlled released](#)[derivatives](#)[nanocomposites](#)[preparation schemes](#)

Keywords Plus

[MOLECULAR-WEIGHT CHITOSAN](#)[MESOPOROUS SILICA NANOPARTICLE](#)[EMULSION CROSS-LINKING](#)[LOADED CHITOSAN](#)[ORAL DELIVERY](#)[CARBOXYMETHYL CHITOSAN](#)[IN-VITRO](#)[THERMOSENSITIVE HYDROGEL](#)[MAGNETIC NANOPARTICLES](#)[HYBRID NANOCOMPOSITES](#)

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Categories/Classification

Research Areas

Biochemistry & Molecular BiologyChemistry

The most significant citation responses to our published works from the last period (2018-2020)

Recent advances (2019-2021) of capillary electrophoresis-mass spectrometry for multilevel proteomics

By

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[McCool, EN](#) (McCool, Elijah N.) [Yang, ZC](#) (Yang, Zhichang) [Shen, XJ](#) (Shen, Xiaojing) [Lubeckyj, RA](#) (Lubeckyj, Rachele A.) [Xu, T](#) (Xu, Tian) [Wang, QJ](#) (Wang, Qianjie) [Sun, LL](#) (Sun, Liangliang)

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Abstract

Multilevel proteomics aims to delineate proteins at the peptide (bottom-up proteomics), proteoform (top-down proteomics), and protein complex (native proteomics) levels. Capillary electrophoresis-mass spectrometry (CE-MS) can achieve highly efficient separation and highly sensitive detection of complex mixtures of peptides, proteoforms, and even protein complexes because of its substantial technical progress. CE-MS has become a valuable alternative to the routinely used liquid chromatography-mass spectrometry for multilevel proteomics. This review summarizes the most recent (2019-2021) advances of CE-MS for multilevel proteomics regarding technological progress and biological applications. We also provide brief perspectives on CE-MS for multilevel proteomics at the end, highlighting some future directions and potential challenges.

Keywords

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[capillary isoelectric focusing-mass spectrometry](#)[capillary zone electrophoresis-mass spectrometry](#)[multilevel proteomics](#)[protein complex](#)[proteoform](#)

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[TOP-DOWN PROTEOMICS](#)[HIGH PEAK-CAPACITY](#)[ZONE-ELECTROPHORESIS](#)[HIGH-EFFICIENCY](#)[PEPTIDE IDENTIFICATION](#)[PROTEIN IDENTIFICATION](#)[INTERFACE DEVELOPMENT](#)[LOADING CAPACITY](#)[213 NM](#)[CE-MS](#)

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Categories/Classification

Research Areas

Spectroscopy

citation to the article:

A simple and rapid LC-MS/MS and CE-MS/MS analytical strategy for the determination of therapeutic peptides in modern immunotherapeutics and biopharmaceuticals
By

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Abstract

Modern therapy of metabolic, neurodegenerative, inflammation, or cancer diseases is recently based on an immunotherapeutic approach. The peptide conjugates represent innovative and effective therapeutics that are better tolerated and are much more specific than small molecule-based medicines. The nature and manufacturing process of these therapeutics make their analysis very challenging. Here, two robust analytical methods based on an on-line combination of ultra-high-performance liquid chromatography with tandem mass spectrometry (UHPLC-MS/MS) and capillary electrophoresis with tandem mass spectrometry (CE-MS/MS) were developed for fast determination of immunogenic synthetic peptide (peptide sequence CADNLHKVVGQST) in a conjugate with bovine serum albumin (BSA) as a carrier protein and is a peptide, conjugate formulated with a vaccine adjuvant - Alhydrogel (R) 2 %. An effective non-enzymatic release step of the peptide from the final peptide conjugate based on acid hydrolysis with the use of 2% formic acid was successfully tested and implemented. The proposed methods were validated according to the ICH guideline and parameters such as linearity, precision, and accuracy, the limit of detection (LOD) or limit of quantification (LOQ) were assessed. Calibration curves were linear within the range of 1-30 $\mu\text{g mL}^{-1}$ and the correlation coefficients were higher than 0.99. The intraday and interday precisions were 3.2-8.1 % (UHPLC-MS/MS), 1.6-9.3 % (CE-MS/MS) and 3.6-10.3 % (UHPLC-MS/MS), 4.1-10.2 % (CE-MS/MS), respectively. The recovery ranged in the interval of 98.4-107.4 % for UHPLC-MS/MS method and 100.3-103.2 % for CE-MS/MS method. The presented approaches represent an effective tool for simple, rapid and robust quantification of immunogens in modern immunotherapeutics and other biopharmaceuticals with appropriate peptide sequences. (C) 2020 Elsevier B.V. All rights reserved.

Keywords

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[Ultra-high-performance liquid chromatography](#)[Capillary electrophoresis](#)[Tandem mass spectrometry](#)[Non-Enzymatic digestion](#)[Peptide conjugates](#)[Biopharmaceuticals - immunotherapeutics](#)

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Categories/Classification

Combination therapy in inflammatory bowel disease - from traditional immunosuppressors towards the new paradigm of dual targeted therapy

By

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Article

Abstract

Background: Combining immunosuppressors has been proposed as a strategy to enhance treatment efficacy in Inflammatory Bowel Disease (IBD).

Aim: To summarize current evidence on combinations of targeted therapies with traditional immunosuppressors or with other targeted therapies.

Methods: A literature search on PubMed and Medline databases was performed to identify relevant articles.

Results: Current evidence supports that the combination of infliximab and thiopurines is more effective than monotherapy with both agents in inducing remission in Crohn's Disease and Ulcerative colitis. Data on other combinations of other biologics and traditional immunosuppressors is lacking or show conflicting results. Vedolizumab seems a potentially effective maintenance regimen after calcineurin inhibitors-based rescue therapy in acute severe ulcerative colitis, as an alternative to thiopurines. Dual Targeted Therapy, which is the combination of 2 targeted therapies, might be a reasonable choice in patients with concomitant IBD and extraintestinal manifestations, or in patients with medical-refractory IBD who lack valid alternatives. Combinations with thiopurines are associated with an increased risk of infections and lymphoma. Data on other combinations is scarcer, but no specific safety issue has emerged so far.

Conclusions: Combination therapies seem to be effective in selected patients, with an overall acceptable safety profile.

Keywords

Keywords

Author Keywords

Crohn's DiseaseUlcerative colitisThiopurinesCalcineurin inhibitorsBiologicsCombination therapy

Keywords Plus

ANTI-TNF-ALPHASCHEDULED INFLIXIMAB MAINTENANCERECOMBINANT HUMAN INTERLEUKIN-10NECROSIS-FACTOR ANTAGONISTEVIDENCE-BASED CONSENSUSCROHNS-DISEASEULCERATIVE-COLITISCO-TREATMENTADALIMUMAB MONOTHERAPYCLINICAL-RESPONSE

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Categories/Classification

Research Areas

Immunology

citation to the article:

Positive pharmacokinetic effect of azathioprine co-medication on infliximab trough levels is dose-dependent

By

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Digestive and Liver Disease

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Article

Abstract

Background: Thiopurines seem to have positive effect on the pharmacokinetics of anti-tumor necrosis factor biologics. It has been suggested that a reduced dose of thiopurines is sufficient to achieve this synergism.

Aims: To assess the differences of infliximab (IFX) trough levels according to the dose of concomitantly used azathioprine (AZA).

Patients & methods: All IBD patients treated with IFX (Remicade (R)) in two IBD centres between November 2015 and April 2017 were eligible. Infliximab trough levels were assessed by ELISA (Ridascreen (R), R-Biopharm). The differences in IFX trough levels according to AZA dose were analyzed statistically.

Results: In total, 125 patients were included, 42 pts (33.6%) on infliximab monotherapy, 83 pts (66.4%) using combined immune suppression.

The respective median IFX levels according to AZA dose were as follows: group 1 (no concomitant AZA) 2.83 $\mu\text{g/ml}$ (range 0-12); group 2 (AZA dose less than 1 mg/kg) 4.91 $\mu\text{g/ml}$ (range 0.09-15.36); group 3 (AZA dose 1 < 2 mg/kg) 5.67 (range 0.16-16.97); group 4 (AZA dose above 2 mg/kg) 7.53 $\mu\text{g/ml}$ (range 1.15-8.73). The differences in IFX trough levels between the respective groups according to AZA dose were statistically significant ($p = 0.0159$).

Conclusion: The positive effect of azathioprine on infliximab levels seems to be dependent on the dose of concomitantly used azathioprine. (C) 2019 Editrice Gastroenterologica Italiana S.r.l. Published by Elsevier Ltd. All rights reserved.

Keywords

Author Keywords

[Azathioprine](#)[Infliximab](#)[Inflammatory bowel disease](#)[Pharmacokinetics](#)

Keywords Plus

[INFLAMMATORY-BOWEL-DISEASE](#)[MEAN CORPUSCULAR VOLUME](#)[CROHNS-](#)

DISEASECOMBINATION

THERAPYIMMUNOMODULATORINTENSIFICATIONIMMUNOGENICITYASSOCIATIONMETABOLITEST

HIOPURINES

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Categories/Classification

Research Areas

3

Optical/electrochemical methods for detecting mitochondrial energy metabolism

By

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Review

Abstract

Abstract

This review highlights the biological importance of mitochondrial energy metabolism and the applications of multiple optical/electrochemical approaches to determine energy metabolites. Mitochondria, the main sites of oxidative phosphorylation and adenosine triphosphate (ATP) biosynthesis, provide the majority of energy required by aerobic cells for maintaining their physiological activity. They also participate in cell growth, differentiation, information transmission, and apoptosis. Multiple mitochondrial diseases, caused by internal or external factors, including oxidative stress, intense fluctuations of the ionic concentration, abnormal oxidative phosphorylation, changes in electron transport chain complex enzymes and mutations in mitochondrial DNA, can occur during mitochondrial energy metabolism. Therefore, developing accurate, sensitive, and specific methods for the in vivo and in vitro detection of mitochondrial energy metabolites is of great importance. In this review, we summarise the mitochondrial structure, functions, and crucial energy metabolic signalling pathways. The mechanism and applications of different optical/electrochemical methods are thoroughly reviewed. Finally, future research directions and challenges are proposed.

Keywords

Keywords Plus

INFRARED FLUORESCENT-PROBE LABEL-FREE DETECTION SOLUBLE TRIARYLBORON-COMPOUND ENDOGENOUS HYDROXYL RADICALS HYDROGEN-PEROXIDE PRODUCTION ELECTRON-TRANSPORT CHAIN METAL-ORGANIC FRAMEWORKS SMALL-MOLECULE PROBE ACID BETA-OXIDATION LIVING CELLS

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Categories/Classification

Research Areas

Chemistry

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Overview and recent advances in electrochemical sensing of glutathione - A review

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Review

Abstract

The present paper is aimed at providing an overview of the recent advances in the electrochemical sensing of glutathione (GSH), an important electrochemically and biologically active molecule, for the period 2012-2018. Herein, the analytical performances of newly developed electrochemical methods, procedures and protocols for GSH sensing are comprehensively and critically discussed with respect to the type of method, electrodes used (new electrode modifications, advanced materials and formats), sample matrices, and basic validation parameters obtained (limit of detection, linear dynamic range, precision, selectivity/evaluation of interferences). This paper considers electrochemical methods used alone as well as the hyphenated methods with electrochemical detection (ECD), such as HPLC-ECD or CE-ECD. The practical applicability of the platforms developed for GSH detection and quantification is mostly focused on pharmaceutical and biomedical analysis. The most significant electrochemical approaches for GSH detection in multicomponent analyte samples and multicomponent matrices and for real-time in vivo GSH analysis are highlighted. The great variability in the electrochemical techniques, electrode approaches, and obtainable performance parameters, discussed in this review, brought new insights not only on current GSH and glutathione disulfide (GSSG) determinations, but, along with this, on the advances in electrochemical analysis from a more general point of view. (C) 2019 Elsevier B.V. All rights reserved.

Keywords

Author Keywords

[Glutathione determination](#)[Advances in electrochemical methods](#)[Electrode materials and modifications](#)[Performance parameters](#)[Pharmaceutical and biomedical analysis](#)

Keywords Plus

[GLASSY-CARBON ELECTRODE](#)[REDUCED GRAPHENE OXIDE](#)[PERFORMANCE LIQUID-CHROMATOGRAPHY](#)[NICOTINAMIDE ADENINE-DINUCLEOTIDE](#)[PASTE ELECTRODE](#)[OXIDATIVE STRESS](#)[ELECTROCATALYTIC DETERMINATION](#)[AMPEROMETRIC DETECTION](#)[OXIDIZED GLUTATHIONE](#)[VOLTAMMETRIC SENSOR](#)

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Categories/Classification

Research Areas

Chemistry

4

Portable Smartphone Platform Integrated with a Nanoprobe-Based Fluorescent Paper Strip: Visual Monitoring of Glutathione in Human Serum for Health Prognosis

By

Chu, SY (Chu, Suyun)

Wang, HQ (Wang, Haiqian) Du, YX (Du, Yuanxin) Yang, F (Yang, Fan) Yang, L (Yang, Liang)

Jiang, CL (Jiang, Changlong)

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Abstract

The glutathione (GSH) level in human serum is closely associated with several life-threatening diseases, and tracing the aberrant GSH level can monitor the subhealth conditions at an early stage for human health prognosis. Developing portable and direct read-out mini-devices is an inevitable trend for reliable point-of-care (POC) detection of GSH in real-time/on-site conditions. We herein report a portable smartphone-sensing platform, a ratiometric fluorescence sensor combined with the 3D-printed smartphone device for rapid, sensitive, quantitative, and on-the-spot determination of GSH in human serum. The powerful fluorescence "off-on" nanoprobe was constructed by mixing the blue carbon dots (CDs) and orange gold nanoclusters (AuNCs) with the assistance of copper ions. The quenched fluorescence can be quickly restored upon interacting with GSH, showing a distinct color variation from blue to purple to orange. Integrated with the paper strip printed by the probe ink, the smartphone platform installed with a Color Recognizer App could accomplish sensitive, reliable, and real-time/on-site detection of GSH in human serum, which shows great significance for early disease diagnosis. The constructed smartphone platform is expected to develop into portable home medical equipment to realize convenient and rapid preliminary monitoring and self-assessment of health.

Keywords

Author Keywords

[Fluorescent sensor](#)[Visual monitoring](#)[Smartphone platform](#)[Glutathione](#)[Health prognosis](#)

Keywords Plus

[CAPILLARY-ZONE-ELECTROPHORESIS](#)[AGGREGATION-INDUCED EMISSION](#)[SENSITIVE DETERMINATION](#)[FACILE PREPARATION](#)[CARBON DOTS](#)[PROBE](#)[CYSTEINE](#)[COMPLEX](#)[NANOCLUSTERS](#)[ASSAY](#)

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Categories/Classification

Research Areas

ChemistryScience & Technology - Other TopicsEngineering

citation to the article:

Ultra-high performance hydrophilic interaction liquid chromatography - Triple quadrupole tandem mass spectrometry method for

tandem mass spectrometry method for determination of cysteine, homocysteine, cysteinyl-glycine and glutathione in rat plasma

By

[Forgacsova, A](#) (Forgacsova, Andrea)

[Galba, J](#) (Galba, Jaroslav) [Mojzisova, J](#) (Mojzisova, Jana) [Mikus, P](#) (Mikus, Peter) [Piestansky, J](#)

(Piestansky, Juraj) [Kovac, A](#) (Kovac, Andrej)

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Article

Abstract

An ultra-high performance hydrophilic interaction liquid chromatography - triple quadrupole tandem mass spectrometry method was developed for the determination of biologically important thiols, namely cysteine, homocysteine, cysteinyl-glycine, glutathione, in rat plasma. The sample preparation procedure as well as the analytical method were comprehensively optimized and subsequently validated. An optimum sample preparation protocol was based on the simple and fast derivatization of the thiols with new derivatization reagent, N-phenylmaleimide, enabling highly selective and sensitive quantification in plasma matrices. The method, characterized by favourable performance parameters and meeting the FDA criteria for biomedical analysis, was successfully applied for monitoring the concentration levels of the selected thiols in the samples from transgenic rat model for tauopathy. The study revealed significant changes in homocysteine and glutathione levels related to tauopathy while other thiols did not indicate such relationship. Indeed, these findings could play an important role in further understanding of tauopathy process in the brain. Moreover, the proposed highly effective, reliable and robust analytical protocol can be easily adapted for other thiol compounds, spreading its application range in this biomedical field. (C) 2018 Elsevier B.V. All rights reserved.

Keywords

Author Keywords

[Thiols](#)[LC-MS/MS](#)[Derivatization](#)[N-phenylmaleimide](#)[Tauopathy](#)

Keywords Plus

[LC-MS/MS METHOD](#)[PRECOLUMN DERIVATIZATION](#)[FLUORESCENCE DETECTION](#)[THIOL COMPOUNDS](#)[HPLC](#)[QUANTIFICATIONS](#)[SAMPLES](#)[DISULFIDES](#)[METABOLISM](#)[MURINE](#)

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Categories/Classification

Research Areas

Chemical Sciences / Chemistry

5

Metallacarborane Sulfamides: Unconventional, Specific, and Highly Selective Inhibitors of Carbonic Anhydrase IX

By

[Gruner, B](#) (Gruner, Bohumir)

[Brynda, J](#) (Brynda, Jiri) [Das, V](#) (Das, Viswanath) [Sicha, V](#) (Sicha, Vaclav) [Stepankova, J](#)

(Stepankova, Jana) [Nekvinda, J](#) (Nekvinda, Jan) [Holub, J](#) (Holub, Josef) [Pospisilova, K](#)

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(Kugler, Michael) [Masek, V](#) (Masek, Vlastimil) [Medvedikova, M](#) (Medvedikova, Martina)

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[Gurska, S](#) (Gurska, Sonja) [Dzubak, P](#) (Dzubak, Petr) [Hajduch, M](#) (Hajduch, Marian) [Rezacova, P](#)

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Abstract

Carbonic anhydrase IX (CAIX) is a transmembrane enzyme that regulates pH in hypoxic tumors and promotes tumor cell survival. Its expression is associated with the occurrence of metastases and poor prognosis. Here, we present nine derivatives of the cobalt bis(dicarbollide)(1-) anion substituted at the boron or carbon sites by alkylsulfamide group(s) as highly specific and selective inhibitors of CAIX. Interactions of these compounds with the active site of CAIX were explored on the atomic level using protein crystallography. Two selected derivatives display subnanomolar or picomolar inhibition constants and high selectivity for the tumor-specific CAIX over cytosolic isoform CAII. Both derivatives had a time-dependent effect on the growth of multicellular spheroids of HT-29 and HCT116 colorectal cancer cells, facilitated penetration and/or accumulation of doxorubicin into spheroids, and displayed low toxicity and showed promising pharmacokinetics and a significant inhibitory effect on tumor growth in syngenic breast 4T1 and colorectal HT-29 cancer xenotransplants.

Keywords

Keywords Plus

COBALT BIS(1,2-DICARBOLLIDE)CARBORANE COMPLEXESMEDICINAL CHEMISTRYTUMOR-GROWTHBORONDERIVATIVESIONCYTOTOXICITYLIGHTPHARMACOPHORES

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Categories/Classification

Research Areas

Pharmacology & Pharmacy

citation to the article:

Novel sulfonamides incorporating 1,3,5-triazine and amino acid structural motifs as inhibitors of the physiological carbonic anhydrase isozymes I, II and IV and tumor-associated isozyme IX

By

[Mikus, P](#) (Mikus, Peter)

[Krajciova, D](#) (Krajciova, Dominika) [Mikulova, M](#) (Mikulova, Maria) [Horvath, B](#) (Horvath, Branislav) [Pecher, D](#) (Pecher, Daniel) [Garaj, V](#) (Garaj, Vladimir) [Bua, S](#) (Bua, Silvia) [Angeli, A](#) (Angeli, Andrea) [Supuran, CT](#) (Supuran, Claudiu T.)

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Article

Abstract

ABSTRACT

A new series of thirty s-triazinyl-substituted aminoalkylbenzenesulfonamides, incorporating a symmetric pair of amino acid moieties, is reported, together with inhibition studies of physiologically relevant human carbonic anhydrase (hCA, EC 4.2.1.1) isoforms. Specifically, against the cytosolic hCA I, II, transmembrane hCA IV and the tumor-associated, membrane-bound hCA IX.

The compounds were prepared by nucleophilic substitution of chlorine atoms from cyanuric chloride (2,4,6-trichloro-1,3,5-triazine) using environmentally friendly water-based synthetic conditions. The products yields ranged in the interval of 43-97%. Purity of the products was verified by the HPLC-DAD-ESI-Q-TOF MS method. Identity of the products was confirmed by the same method plus NMR and IR.

The products showed weak inhibition of the cytosolic, off-target isozyme hCA II, but some of them were low nanomolar (i.e. strong) inhibitors of the tumor-associated hCA IX. The series offered representatives selective towards isozymes hCA I, IV and IX. 2,2'4(6-(4-sulfamoylphenethylamino)-1,3,5-triazine-2,4-diylbis(imino)) disuccinic acid demonstrated highest selectivity to the tumor-associated isoform hCA IX over off-target isozymes, with impressive K-I ratio (hCA II/hCA IX) 213.9 and inhibition constant equal to acetazolamide (K-I = 25.8 nM). Although the selectivities of some other products, e.g. those conjugating Leu and Glu, were a bit lower (188.7 and 84.3, respectively) their inhibition constants were similar to acetazolamide too (24.0 and 27.1, respectively).

The selected most impressive results from the inhibition study were interpreted via molecular modeling experiment (docking in Glide) revealing different inter-molecular enzyme-substrate interaction of 2,2'-((6-((4-sulfamoylphenethyl)amino)-1,3,5-triazine-2,4-diyl)bis(imino))disuccinic acid within specific hCA IX and hCA II microregions. Therefore, several selected compounds from this study can be considered as highly effective and selective inhibitors of hCA IX, worthy to further (preclinical) investigation.

Keywords

Author Keywords

[1,3,5-Triazine](#)[Benzene sulfonamides](#)[Amino acids](#)[Carbonic anhydrase](#)[Enzyme inhibition](#)[Isoform selectivity](#)

Keywords Plus

[DRUG-LIKE MOLECULES](#)[ISOFORMS](#)[ICANCER-THERAPY](#)[EXPRESSION](#)[HYPOXIA](#)[MOIETIES](#)[PROGNOSIS](#)[XIICARCINOMAS](#)[BENZENESULFONAMIDES](#)

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Categories/Classification

Research Areas

Biochemistry & Molecular BiologyChemistry

VI.5 - Participation in conducting (leading) the most important research projects or art projects over the last six years

- | | |
|---|--|
| 1 | VEGA 1/0873/15, <i>Principal investigator of the project</i> (Development of new separation methods with MS/MS detection to optimize the treatment of non-specific inflammatory bowel diseases with thiopurines) |
| 2 | KEGA 022UK-4/2015, <i>Principal investigator of the project</i> (Specialized educational program "Advanced methods of liquid chromatography with mass spectrometry in pharmacy and biomedicine" for master's and doctoral studies: preparation of textbooks, lectures and methodic letters) |
| 3 | APVV-15-0585, <i>Principal investigator of the project</i> (Analytical evaluation of clinical profiles and markers in relation to the optimization of the treatment of non-specific inflammatory bowel diseases with thiopurines) |
| 4 | KEGA 027UK-4/2020, <i>Principal investigator of the project</i> (Creation of a comprehensive teaching material in the module "Analytical chemistry - Instrumental methods" of the master's study of pharmacy in English) |
| 5 | VEGA 1/0463/18, <i>Principal investigator of the project</i> (New approaches in the analytical evaluation of drugs, their biodegradation products and metabolic markers in biological matrices in relation to the optimization of the treatment of non-specific inflammatory bowel diseases) |

VII. - Overview of organizational experience related to higher education and research/artistic/other activities

VII.a - Activity, position	VII.b - Name of the institution, board	VII.c - Duration
Vice-Dean for International Relations and Faculty Development (including the study agenda of the Master's study program Pharmacy in English)	Faculty of Pharmacy, Comenius University in Bratislava	2010-2013
Member / Chairman of the Commission for State Final Examinations (Pharmaceutical Chemistry, Pharmacology, Pharmacognosy, Pharmaceutical Technology, Social Pharmacy and Pharmacy, Master's Thesis Defense)	Faculty of Pharmacy, Comenius University in Bratislava	2005-presence
Chairman of the Commission for the Defense of Rigorous Thesis and Rigorous Examination	Faculty of Pharmacy, Comenius University in Bratislava	2015-presence
Commission chairman and guarantor of Pharmaceutical Chemistry (doctoral, habilitation and inauguration proceedings)	Faculty of Pharmacy, Comenius University in Bratislava	2018-presence
Commission member of Analytical Chemistry and Pharmaceutical Analysis at the Faculty of Natural Science, Comenius University in Bratislava and the Faculty of Pharmacy, Charles University in Prague, respectively	Faculty of Natural Science, Comenius University in Bratislava, Faculty of Pharmacy in Hradec Králové, Charles University in Prague	2017-presence
The American Chemical Society - member	The American Chemical Society	2013-presence
The Slovak Medical and Pharmaceutical Society - member	The Slovak Medical and Pharmaceutical Society	2007-presence

VIII. - Overview of international mobilities and visits oriented on education and research/artistic/other activities in the given field of study

VIII.a - Name of the institution	VIII.b - Address of the institution	VIII.c - Duration (indicate the duration of stay)	VIII.d - Mobility scheme, employment contract, other (describe)
Consiglio Nazionale delle Ricerche, Istituto di Cromatografia	Roma, Italy	January-April 1996	project: Tempus-Phare (JEP No 09101-95, 1995-98). Doctoral study and research stay (guarantor: Dr. Salvatore Fanali)
VFU/Masaryk University in Brno, Faculty of Pharmacy; Charles University in Prague, Faculty of Pharmacy in Hradec Králové	Brno, Hradec Králové, Czech Republic	continuously	member of commissions for the defense of doctoral theses, member of habilitation commissions, member of inaugural commissions

IX. - Other relevant facts

IX.a - If relevant, other activities related to higher education or research/artistic/other activities are mentioned	Reviewer for the reputable international journals: Journal of Chromatography A, Journal of Chromatography B, Talanta, Journal of Pharmaceutical and Biomedical Analysis, Electrophoresis, Chirality, Molecules, Journal of Pharmacy & Pharmaceutical Sciences, Analytical
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and Bioanalytical Chemistry, Journal of Chromatographic Science, Journal of Separation Science, Analytica Chimica Acta, Analytical Chemistry, Chemical Communications, Journal of Medicinal Chemistry, Microchemical Journal, and others (since 2004)

Invited Editorial Board Member: Separations

European social fund project "Enhancing the quality of research and development of young scientists and teachers at FP CU" (2007).

Evaluation committee member.

COST Action portASAP ("European network for the promotion of portable, affordable and simple analytical platforms"), *member*.

Peter Mikuš, Lucia Veizerová, Ján Kyselovič, INTERNATIONAL EDUCATION AND RESEARCH PROGRAM AT FACULTY OF PHARMACY COMENIUS UNIVERSITY IN BRATISLAVA: TECHNOLOGY OF RADIOPHARMACEUTICALS, Aspects and the ways of development of nuclear medicine in Russia, Ekaterinburg, 27.-28.10.2011 (invited lecture).

Peter Mikuš, Juraj Piešťanský, Katarína Maráková, Advanced CE-MS hyphenations for ultratrace determination of drugs and their metabolites in complex matrices, 16. annual School of mass spectrometry, Frymburk 13. - 18. 9. 2015 (invited lecture)

etc.

Awards:

- Awarded for the best analytical innovations in 2011: Main Shimadzu award 2011 (63. Congress of chemists, Tatranské Matliare, 5. - 9. 9. 2011)
- Awarded for the scientific literature by the Literary fund, Section for scientific literature and computational programs, per 2012 year (awarded in 2013)
 - for the scientific literature in the category of natural and technical sciences
 - for the remarkable scientific citation response in the category of natural and medicinal sciences
- Rector of Comenius University award to the supervisor of excellent diploma thesis (more than 5 awarded theses)
- Awarded for the best poster presented at the international conference (1st Caparica Christmas Conference On Sample Treatment, on December 8-10, 2014 in Lisbon)
- Award at the occasion of 65. Anniversary of foundation of the Faculty of Pharmacy

Comenius University in Bratislava, 2017 /
(medal for the contribution in the Faculty
development)

- Award at the occasion of Students day 17th
November, 2017 (Rector's letter of thanks for
the contribution in the Faculty development)
- Awarded for the best poster presented at the
international conference (24th International
Symposium on Separation Sciences, 21st
International Conference Analytical Methods
and Human Health, June 17-20, 2018, Jasna,
Slovakia)
- Awarded for the best analytical innovations in
2019: Shimadzu award 2019 (71. Congress of
chemists, Smokovec, 9. - 13.9.2019)
- Awarded for the scientific literature by the
Literary fund, Section for scientific literature
and computational programs, per 2018 year
(awarded in 2019)
 - for the scientific literature in the
category of biological and medicinal
sciences
- Awarded for the best poster presented at the
international conference (5th Caparica
Christmas Conference On Sample Treatment,
on November 15-18, 2021 in Lisbon)

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