Teaching and Learning Bioanalysis CEEPUS Network: Activities, Achievements, Future Plans

Gabriella Donáth-Nagy

"George Emil Palade" University of Medicine, Pharmacy, Science and Technology of Targu Mures, Faculty of Pharmacy, Department of Pysical Chemistry

International Conference of CEEPUS Partners, Budapest, September 25, 2024

Actual partners

21 partners in the Network:

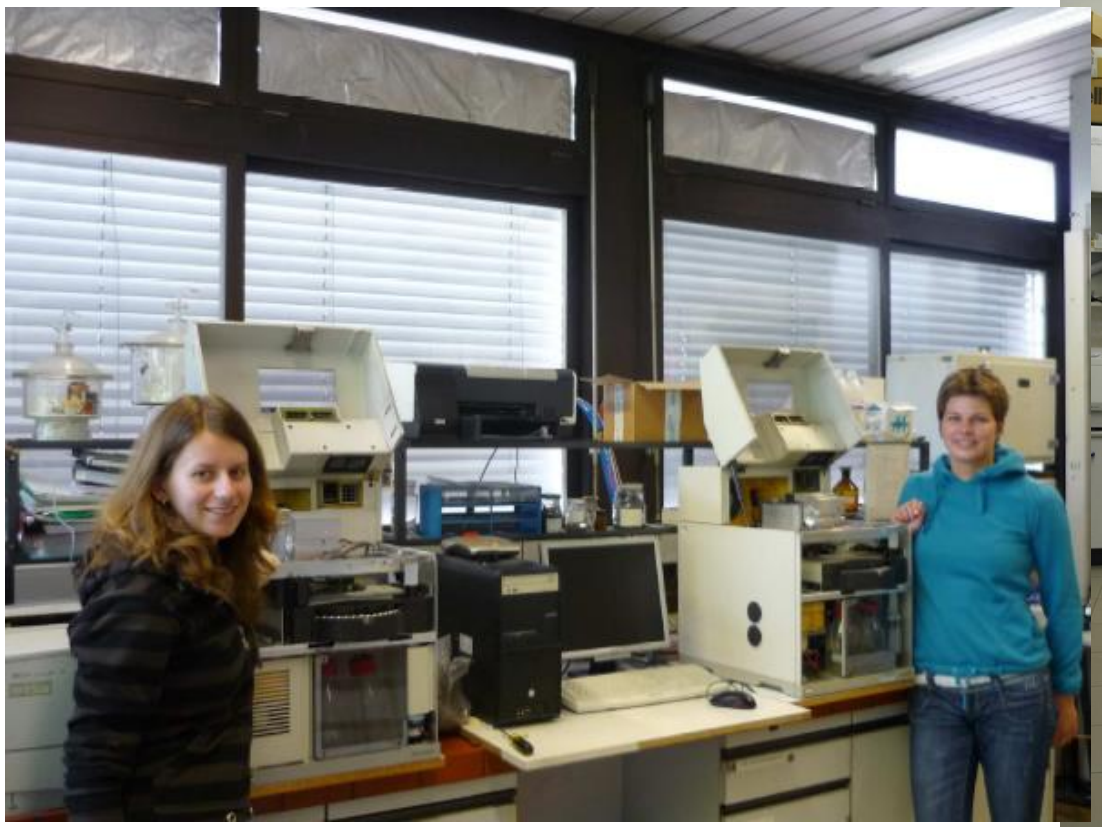
- University of Vienna (A1)
- University of Graz (A2)
- Neofit Rilski South-West University of Blagoevgrad (BG)
- Charles University of Prague (CZ)
- University of Zagreb (HR1)
- Josip Juraj Strossmayer University of Osijek (HR2)
- University of Pécs (2 units) (HU1, HU4)
- University of Debrecen (HU2)
- Semmelweis University of Budapest (HU3)
- Sts. Cyril and Metodius of Skopje (MK1)

- Goce Delcev University of Stip (MK2)
- Nicolae Testemitanu University of Medicine and Pharmacy of Chisinau (MD)
- University of Warsaw (PL)
- Babes Bolyai University of Cluj (RO1)
- George Emil Palade University of Medicine, Pharmacy, Science and Technology of Tg. Mures (RO2)
- Iuliu Hatieganu University of Medicine and Pharmacy of Cluj (RO3)
- Sapientia University of Cluj (RO4)
- Comenius University of Bratislava (SK1)
- J. Selye University of Komarno (SK2)
- Hassan Prishtina University of Kosovo (KS)

Activities/mobility exchange/research

- Separation science
  - Chromatography
  - Electrophoresis
  - Electrochromatography
- Bioanalytical methods
- Clinical and pharmaceutical analysis
- Biopolymers, peptides
- Nanotechnology

Activities/laboratory research



Lectures, discussions

Summer Schools Bratislava 1999, Pécs, 2000

Joint Programs

1. Design, Synthesis and Characterization of a New Class of Cationic Antimicrobial Peptides
-Neofit Rilski South-West University - Blagoevgrad, Faculty of Natural Sciences, Department of Chemistry
-Charles University, Faculty of Science
-University of Pécs, Department of Analytical Chemistry, Fac. of Sciences and Institute of

2. Joint Program in Bioanalytical Evaluation Methodology with e-learning methods
-University of Pécs, Department of Analytical Chemistry, Fac. of Sciences and Institute of Bioanalysis, Fac. of Medicine
-"Sapientia" University of Cluj Napoca, Faculty of Economics, Socio-Human Sciences and Engineering, Miercurea Ciuc
-University of Pécs, Doctoral School of

3. Joint degree in Bioanalysis
-"George Emil Palade" University of Medicine, Pharmacy, Science and Technology of Targu Mures, Department of Physical Chemistry
-State University of Medicine and Pharmacy "Nicolae Testemitanu", Faculty of Pharmacy
-"Iuliu Hatieganu" University of Medicine and Pharmacy of Cluj Napoca, Faculty of Pharmacy

4. Joint Research and Education in Microchip and Capillary Electrophoresis Bioseparations
Charles University, Faculty of Science
Comenius University in Bratislava, Department of Analytical Chemistry, Faculty of Natural Sciences,Comenius University in Bratislava

5. Joint Research and Education in the bioanalytical applications of electrodriven separations in capillary and chip-based devices hyphenated with various in-line and off-line detection strategies
-Charles University, Faculty of Science
-Comenius University in Bratislava, Department of Analytical Chemistry, Faculty of Natural Sciences,Comenius University in Bratislava
-"Iuliu Hatieganu" University of Medicine and Pharmacy of Cluj Napoca, Faculty of Pharmacy

6. Summer School on Bioanalysis
- All participating Units

Results – scientific papers

Papers published in the framework: **229**

- Ferencz E, Kovacs B, Boda F, et al. Simultaneous determination of chiral and achiral impurities of ivabradine on a cellulose tris(3-chloro-4-methylphenylcarbamate) chiral column using polar organic mode. J Pharm Biomed Anal. 2020; 177:112851. 10.1016/j.jpba.2019.112851
- Bartos, Hunor, Márta Balázs, Ildikó H. Kuzman, Szabolcs Lányi, and Ildikó Miklóssy: "Production of High Added-Value Chemicals in Basfia succiniciproducens: Role of Medium Composition" *Sustainability*, 2021. 13, no. 6: 3513. https://doi.org/10.3390/su13063513
- Tomnikova, A., Kozlik, P., Krizek. T.: Monosaccharide profiling of glycoproteins by capillary electrophoresis with contactless conductivity detection. *Electrophoresis* 2022 (available online). DOI: 10.1002/elps.202200033
- Cokrtova, K., Mares, V., Krizek, T.: On-capillary fluorescent labeling of saccharides for capillary electrophoresis. *Electrophoresis* 2022 (available online). DOI: 10.1002/elps.202200136
- Narmin Hamidli, Blerta Pajaziti, Melinda Andrási, Cynthia Nagy, Attila Gáspár: Determination of human insulin and its six therapeutic analogues by capillary electrophoresis – mass spectrometry inzulin, J.Chromatogr. A., 2022, 463351 (B.Pajaziti is from the University of Kosovo)
- Melinda Andrási, Blerta Pajaziti, Bettina Sípos, Cynthia Nagy, Narmin Hamidli, Attila Gáspár: Study of the degradation of human insulin, DDRS, 2021 International Conference on Advances in Pharmaceutical Drug Development, Quality Control and Regulatory Sciences, Budapest, 15 November – 17 November, 2021, Acta Pharmaceutica Hungarica 91, 169-170, 2021
- Pogrebnoi, S., O, Stingaci, E., Lupascu, L., Valica, V., Uncu, L., Smetanscaia: The synthesis of triazolium salts as antifungal agents: a biological and in silico evaluation. In *Antibiotics* 2022, 11, 588.
- Becze, A., Vincze, E-B., Lányi, Sz., Mara Gy. Evaluation of structural carbohydrate degrading capacity of PGP bacterial strains using different methods. University Politehnica of Bucharest, Scientific Bulletin Series B: Chemistry and Materials Science, 2022, 84(1): 3-18
- Vlckova N., Simonova A., Duris M., Cokrtova K., Almquist S., Krizek. T.: Detection techniques for carbohydrates in capillary electrophoresis - a comparative study. *Monatshefte für Chemie* 154 (2023) 967-975. DOI: 10.1007/s00706-023-03109-9
- Dushkov A., Vosahlova Z., Tzintzarov A., Kalikova K., Krizek T., Ugrinova I.: Analysis of the Ibotenic Acid, Muscimol, and Ergosterol Content of an Amanita Muscaria Hydroalcoholic Extract with an Evaluation of Its Cytotoxic Effect against a Panel of Lung Cell Lines In Vitro. *Molecules* 28 (2023) 6824. DOI: 10.3390/molecules28196824
- Folprechtova D., Schmid M. G., Armstrong D. W., Kalikova K.: The Enantioselective Potential of NicoShell and TeicoShell Columns for Basic Pharmaceuticals and Forensic Drugs in Sub/Supercritical Fluid Chromatography. *Molecules* 28 (2023) 1202. DOI: 10.3390/molecules28031202

Results
MSc and PhD degrees: 107

- Zsofi Sajtos (18.10.2022): Comparative analysis of honeys and their application to estimate environmental
- Lajos Papp. Researches on chiral analysis of proton pump inhibitors with performant analytical methods, 2022, George Emil Palade University of Medicne, Pharmacy. Science and Technology of Tg. Mures
- Cârcu-Dobrin Melania: Research on the chiral separation of medicinal substances used in cardiovascular therapy, 2022, George Emil Palade University of Medicne, Pharmacy. Science and Technology of Tg. Mures.
- Nikol Vlckova: Comparison of detection techniques for analysis of saccharides by capillary electrophoresis. Charles University, Faculty of Science, Prague 2023 (MSc).
- Katarína Hamrakova: Electrokinetic chromatography in nonaqueous and mixed solvents: Determination of critical micellar concentration. Charles University, Faculty of Science, Prague 2023 (MSc).
- Denisa Folprechtova: Detailed characterization of macrocyclic glycopeptide-based chiral stationary phases in SFC. Charles University, Faculty of Science, Prague 2023 (PhD).
- Mgr. Barbora Barancová, Diploma (MSc.) thesis: Development and validation of analytical methods for the determination of active pharmaceutical ingredients in pharmaceutical substances using miniaturized electrokinetic separation techniques, Comenius University Bratislava, Faculty of Natural Sciences, Department of Analytical Chemistry, Bratislava 2023
- RNDr. Ján Šupauer, doctoral thesis: Determination of homocysteine by high-performance liquid chromatography with mass spectrometry method in human plasma, Comenius University Bratislava, Faculty of Natural Sciences, Department of Analytical Chemistry, Bratislava 2023
- Cynthia Nagy: The development of microfluidic immobilized enzymatic reactors for proteomic applications, 2023, June 30, PhD defence
- Narmin Hamidli: Intact protein analysis using capillary zone electrophoresis-mass spectrometry in different capillaries, 2023, June 30, PhD defence
- Ruben Szabó: MS measurements of monoclonal antibodies, 2023, MSc
- Dimana Georgieva Dimitrova: Synthesis of Peptide Molecules, Analogues of Lactoferricin and Study for Antimicrobial and Anti-Tumor Activity, 2023, Blagoevgrad, PhD defence

Achievements

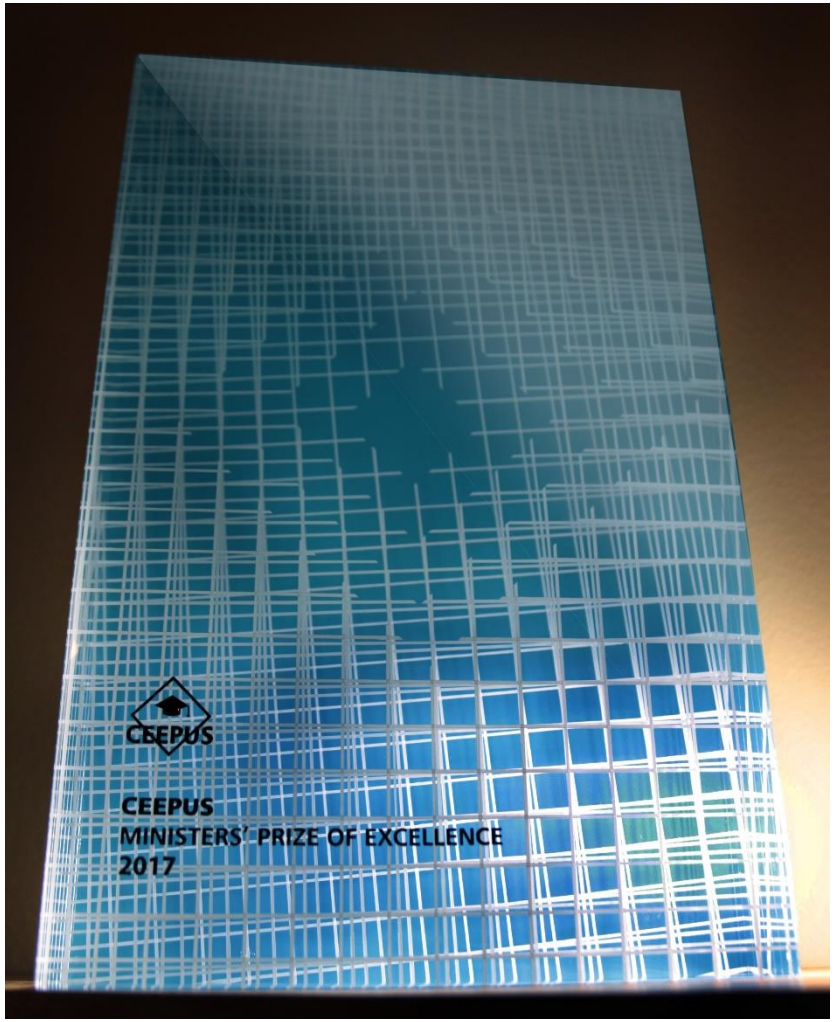
Ministers Prize of excellence 2003

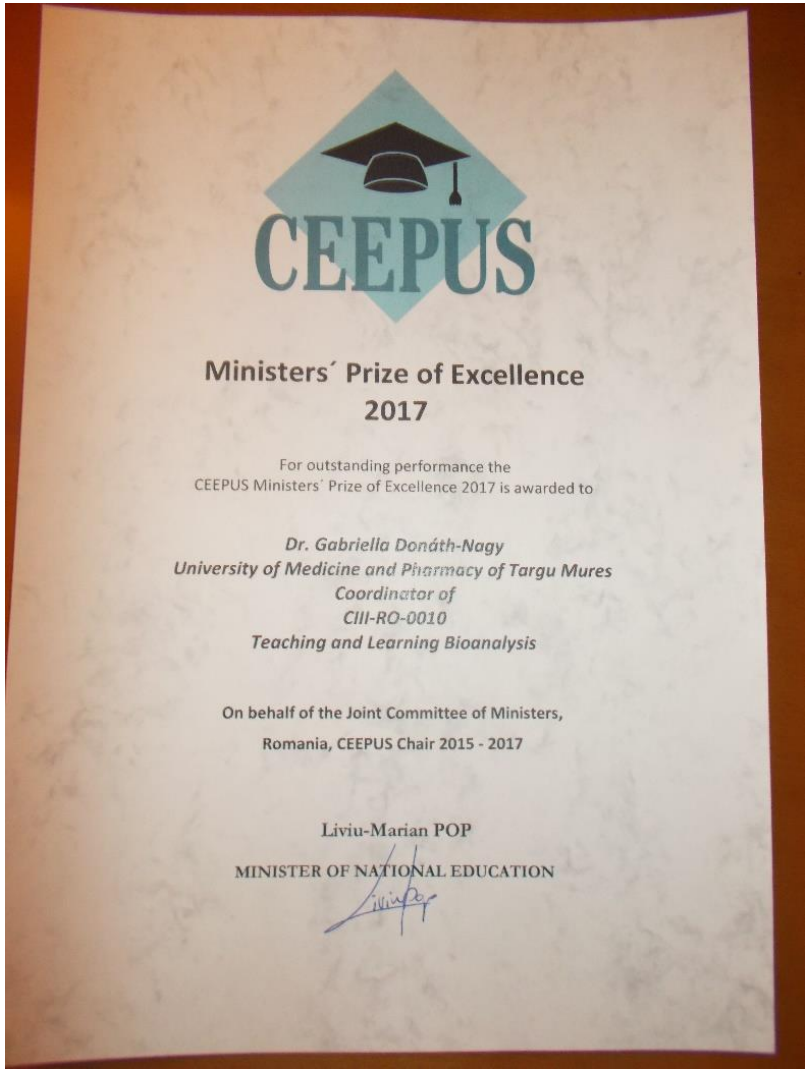
Achievements

Ministers Prize of excellence 2011

Achievements

Ministers Prize of excellence 2018





Special activity during Academic Year 2023/2024

CEEPUS Intensive Course in Bioanalysis, Budapest, 22-31.05.2024

Presenters
Bodoki, Ede
Donáth-Nagy, Gabriella
Feher, Bence
Harsfalvi, Jolan
Ivanova-Petropulos, Violeta
Kellermeyer, Miklos
Kiss, Balint
Krizek, Tomas
Salamon, Pal
Schmid, Martin
Takatsy, Aniko
Toth, Gergo
Uncu, Livia
Zolcsak, Adam

Students
Simonova, Alice
Langari, Ariana
Tzintzarov, Alexander
Vlahova, Zlatina

Students
David, Soma
Pálosi, Réka
Tófalvi, Kriszta
Kabai, Ágota

Students
Panev, Kristina
Kovács, Sándor
Medvés, Noémi Eliza
Kiss, Iulia

Students
Jovanovik, Ivana
Bogeva, Elena
Antal, Adél
Olah, Ingrid – Leticia
Csorja, Ráhel
Mazur, Ecaterina
Gritcan, Ana

2024	HOUR scheduled beginning of the daily teaching programs. (Not listed here are the visits of museums or social programs)					
May	9	10	11	12	14	15
22						
23 D1	Welcome Gabriella Donath Nagy, Jolán Hársfalvi, Introduction of the Students	Periodic phenomena and pattern formation in chemical and biological systems (Gabriella Donáth-Nagy)	Protein structure determination in solution with X-ray and neutron small-angle scattering. Hands-on experience in interpreting structural biology data (Bence Fehér)		Nanomanipulation of single viruses (Bálint Kiss	Life from University Tirgu Mures to PhD Semmelweis and family in Budapest a discussion till 18:00 (Ünige Murvai)
24 D2		From single molecules to the living organism. Passion for discovery and value-driven leadership Miklós Kellermayer	Resonance theory and practice in small groups at 7 working places (Ádám Zolcsák)		Atomic force microscopy (AFM) (Ádám Zolcsák, Pál Salamon)	
25 D3	Explore links between bioanalysis and biophysics, force sensing during primary hemostasis. Practice: preparation of a multimer protein and its AFM Jolán Hársfalvi, Csilla Csányi, Pál Salamon			Universal method for synthesis of artificial gel antibodies by the imprinting approach combined with a unique electrophoresis technique for detection of minute structural differences of proteins, viruses, and bacteria (Anikó Takátsy, Department of Biochemistry and Medical Chemistry, and Szentagothai Research Centre, University of Pecs, Pecs, Hungary)		
26						
27 D4	In silico biophysics of transmembrane proteins Tamás Hegedüs	Analytical and biomedical applications of molecularly imprinted polymers (Ede Bodoki)	Demonstration of electrochemical sensing using a portable electrochemical system (Bogdan Cezar Iacob	Phosphorylation-dependent structure of titin Practice: (Zsolt Mártonfalvi)	Demonstrations and measurement options at the Bekesi Research Centre (Optical tweezers, Optical microscopy, Optical spectroscopy (Balazs Kretzer)	
28 D5	Biophysics of single molecules Balog Erika	Nanochemistry and its medical applications Angéla Jedlovszky-Hajdu Laboratory visit & work Bálint Budavári Molnar Kristof, Halmoczki Sarolta, Palos Veronika, Budavari Balint es Juhasz Akos			How to develop an HPLC separation method for pharmaceutical quality control (Martin Schmid)	Live demonstration of how to compare analysis results of real Viagra samples with fakes (Martin Schmid)
29 D6	Recent advances in chiral analysis (Gegő Tóth)	HPLC measurement by students in 4 groups (Gegő Tóth)		Practical method development in capillary electrophoresis Tomas Krizek		

FUTURE?

Goals:

Continuing the present activities

Preparing the Network Report for the Academic Year 2023/2024

Preparing the Network Application for the Academic Year 2025/2026

Next Summer School in Zagreb

Developing new Joint Programs

Involving young scientists

CEEPUS NETWORK TEACHING AND LEARNING BIOANALYSIS

THANK YOU FOR YOUR ATTENTION!