Department of analytical methods

Research area

- Routine determination of full fatty acid profile including cis-trans isomers in clinical and food samples.
- Chromatographic determination of anesthetics, antibiotics, taxanes in clinical samples or in cell cultures.
- Development of new electrophoretic strategie for rapid determination of amino acids, saccharides and other metabolites in various clinical samples that represent background for solution of different pharmcological and physiological studies.
- Development of preconcentration techniques for sensitive drug monitoring in the context of their pharmacokinetic studies.
- Construction of contactless conductivity detector for microscale separation techniques.
- Development of on-line capillary electrophoresis with microdialysis sampling.

Laboratory equipment

- Gas chromatograph Shimadzu GC-17A with FID/NPD detectors.
- Gas chromatograph Agilent GC 7890B with mass selective detector Agilent 5977B Inert Plus.
- Liquid chromatograph Shimadzu LC-10AD with UV/VIS and fluorescent detector.
- Agilent 7100 Capillary Electrophoresis System and HP3D Capillary Electrophoresis System (Agilent Technologies) equipped with diod-array detector, contactless con¬ductivity detector, fluorescence detector ARGOS 250B (Flux Instruments) and mass spectrometry detector CE/ MS Single Quad ES Superior Line Bundle (Agilent Tech¬nologies).
- Microchip electrophoresis with a lab-build contactless detector.
- Instrumentation for microdialysis sampling.
- Fully equipped biochemical labo¬ratory for preparation and processing of the samples.

Personnel

- doc. RNDr. Ing. Petr Tůma, Ph.D.
- Mgr. Martin Jaček
- Blanka Sommerová

PhD student:

- Mgr. Martin Jaček

Graduate PGS:

- Mgr. Václav Pavlíček, Ph.D.

Publications in international journals with impact factor over the last five years

1. Opekar F., Tůma P.: **An air?assisted flow?gating interface for capillary electrophoresis**, Electrophoresis 2019, 40, 1-5. IF2017 2,569. https://doi.org/10.1002/elps.201800421
2. Tůma P., Sommerová B., Šiklová M.: **Monitoring of adipose tissue metabolism using microdialysis and capillary electrophoresis with contactless conductivity detection**, Talanta 2019, 192, 380-386. IF2017 4,244. https://doi.org/10.1016/j.talanta.2018.09.076
3. Tůma P., Bursová M., Sommerová B., Horsley R., Čabala R., Hložek T.: **Novel electrophoretic acetonitrile-based stacking for sensitive monitoring of the novel antiepileptic drug perampanel in human serum**, J. Pharm. Biomed. Anal. 2018, 160, 368-373. IF2017 2,831. https://doi.org/10.1016/j.jpba.2018.08.006
4. Opekar F., Tůma P.: **Direct sample injection from a syringe needle into a separation capillary**, Anal. Chim. Acta. 2018, 1042, 133-140. IF2017 5,123. https://doi.org/10.1016/j.aca.2018.07.026
5. Krauzová E., Tůma P., De Glisezinski I., Štich V., Šiklová M., **Metformin Does Not Inhibit Exercise-Induced Lipolysis in Adipose Tissue in Young Healthy Lean Men**, Frontiers in Physiology 2018, Volume 9, Article 604, 1-7. IF2017 3,394. https://doi.org/10.3389/fphys.2018.00604
6. Křížek T., Kuchař M., Bursová M., Horsley R., Tůma P., Čabala R., Hložek T.: **Menthol-based hydrophobic deep eutectic solvents: Towards greener and efficient extraction of phytocannabinoids**, J. Clean. Prod. 2018, 193, 391-396. IF2017 5,715 https://doi.org/10.1016/j.jclepro.2018.05.080

7. Tůma P., Heneberg P., Vaculín Š., Koval D., **Electrophoretic large volume sample stacking for sensitive determination of the anti-microbial agent pentamidine in rat plasma for pharmacological studies**, Electrophoresis 2018, 39, 2605-2611. IF2017 2,569 http://dx.doi.org/10.1002/elps.201700440
8. Jelínek M., Balušíková K., Daniel P., Němcová-Fürstová V., Kirubakaran P., Jaček M., Wei L., Wang, X., Vondrášek J., Očima I., Kovář J., **Substituents at the C3' and C3'N positions are critical for taxanes to overcome acquired resistance of cancer cells to paclitaxel.** Toxicology and Applied Pharmacology. 2018, **347**(May), 79-91. IF2017 3,616 https://doi.org/10.1016/j.taap.2018.04.002
9. Hložek T., Křížek T., Tůma T., Bursová M., Coufal P., Čabala R.: **Quantification of paracetamol and 5-oxoproline in serum by capillary electrophoresis: Implication for clinical toxicology**, J. Pharm. Biomed. Anal. 2017, 145, 616-620. IF2017 2,831 https://doi.org/10.1016/j.jpba.2017.07.024
10. Opekar F., Tůma P.: **Coaxial flow-gating interface for capillary electrophoresis**, J. Sep. Sci. 2017, 40, 3138-3143. IF2017 2,415 http://dx.doi.org/10.1002/jssc.201700412
11. Gojda J., Straková R., Plíhalová A., Tůma P., Potočková J., Polák J., Anděl M.: **Increased incretin but not insulin response after oral versus intravenous branched chain amino acids,** Ann. Nutr. Metab. 2017, 70, 293-302. IF2017 3,051 http://dx.doi.org/10.1159/000475604
12. Gojda J., Rossmeislová L., Straková R., Tůmová J., Elkalaf M., Jaček M., Tůma P., Potočková J., Krauzová E., Waldauf P., Trnka J., Štich V., Anděl M.: **Chronic dietary exposure to branched chain amino acids impairs glucose disposal in vegans but not in omnivores**, Eur. J. Clin. Nutr. 2017, 71, 594-601. IF2017 2,954 http://dx.doi.org/10.1038/ejcn.2016.274
13. Opekar F., Tůma P.: **Hydrodynamic sample injection into short electrophoretic capillary in systems with a flow-gating interface**, J. Chromatogr. A 2017, 1480, 93-98. IF2017 3,716 http://dx.doi.org/10.1016/j.chroma.2016.12.029
14. Tůma P.: **Frequency-tuned contactless conductivity detector for electrophoretic separation of clinical samples in capillaries with very small internal dimensions**, J. Sep. Sci. 2017, 40, 940-947. IF2017 2,415 http://dx.doi.org/10.1002/jssc.201601213
15. Pavlíček V., Tůma P.: **The use of capillary electrophoresis with contactless conductivity detection for sensitive determination of stevioside and rebaudioside A in foods and beverages**, Food Chem. 2017, 219, 193-198. IF2017 4,946 http://dx.doi.org/10.1016/j.foodchem.2016.09.135
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19. Tůma P.: **The Use of Polarity Switching for the Sensitive Determination of Nitrate in Human Cerebrospinal Fluid by Capillary Electrophoresis with Contactless Conductivity Detection**, J. Chromatogr. A 2016, 1447, 148-154. IF2016 3,981 http://dx.doi.org/10.1016/j.chroma.2016.04.038
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21. Opekar F., Nesměrák K., Tůma P.: **Electrokinetic injection of samples into a short electrophoretic capillary controlled by piezoelectric micropumps**, Electrophoresis 2016, 37, 595-600. IF2016 2,744 http://dx.doi.org/10.1002/elps.201500464
22. Opekar F., Tůma P.: **A simple impedance tester for determining the water content in organic solvents**, Sens. Actuator B-Chem. 2015, 220, 485-490. IF2015 4,758 http://dx.doi.org/10.1016/j.snb.2015.05.071
23. Tůma P., Opekar F.: **Contactless conductometric determination of methanol and ethanol in samples containing water after their electrophoretic desalination**, Electrophoresis 2015, 36, 1976-1981. IF2015 2,482 http://dx.doi.org/10.1002/elps.201500174
24. Makrlíková A., Opekar F., Tůma P.: **Pressure-assisted introduction of urine samples into a short capillary for electrophoretic separation with contactless conductivity and UV spectrometry detection**, Electrophoresis 2015, 36, 1962-1968. IF2015 2,482 http://dx.doi.org/10.1002/elps.201400613
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32. Kadlecová T., Opekar F., Tůma P.: **Usnadněné hydrodynamické dávkování vzorku do separační kapiláry v laboratorních elektroforetických aparaturách**, Chem. Listy 2013, 107, 486-490. IF2013 0,196 **ISSN:** 0009-2770
33. Matějčková J., Samec M., Samcová E., Rokyta R., Tůma P.: **The Effect of Administration of Vitamin E on the Level of Plasmatic Malondialdehyde During Surgical Removal of the Carcinoma of Ovaries and Endometrium**, Eur. J. Gynaecol. Oncol. 2013, 34, 329-331. IF2013 0,602 **ISSN:** 03922936
34. Tůma P., Opekar F., Samcová E.: **Very Fast Electrophoretic Separation on Commercial Instruments Using a Combination of Two Capillaries with Different Internal Diameters**, Electrophoresis 2013, 34, 552-556., IF2013 3,162 http://dx.doi.org/10.1002/elps.201200524
35. Tůma P., Opekar F., Samcová E., Štulík K.: **The Use of a Multi-channel Capillary for Electrophoretic Separations of Mixtures of Clinically Important Substances with Contactless Conductivity and UV Photometric Detection**, Electrophoresis 2013, 34, 2058-2064. IF2013 3,162 http://dx.doi.org/10.1002/elps.201200498
36. Opekar F., Tůma P., Štulík K.: **Contactless Impedance Sensors and Their Application to Flow Measurements**, Sensors 2013, 13, 2786-2801. IF2012 1,953 http://dx.doi.org/10.3390/s130302786
37. Gojda J., Patková J., Jaček M., Potočková J., Trnka J., Kraml P., Aanděl M.: **Higher insulin sensitivity in vegans is not associated with higher mitochondrial density.** European Journal of Clinical Nutrition. 2013, 67(12), 1310-1315. IF2013 2,950 https://doi.org/10.1038/ejcn.2013.202 .
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Chapters in International Monographs

1. Tůma P.: **Rapid and Sensitive Determination of Branched-Chain Amino Acids in Human Plasma by Capillary Electrophoresis with Contactless Conductivity Detection for Physiological Studies**, in Phillips T.M: Clinical Applications of Capillary Electrophoresis, Methods in Molecular Biology 2019, Springer, 1972, ISBN 978-1-4939-9212-6. http://dx.doi.org/10.1007/978-1-4939-9213-3_2
2. Tůma P.: **The Control of Glucose and Lactate Levels in Nutrient Medium after Cell Incubation and in Microdialysates of Human Adipose Tissue by Capillary Electrophoresis with Contactless Conductivity Detection**, in Phillips T.M: Clinical Applications of Capillary Electrophoresis, Methods in Molecular Biology 2019, Springer, 1972, ISBN 978-1-4939-9212-6. http://dx.doi.org/10.1007/978-1-4939-9213-3_7
3. Tůma P., Opekar F.: **Detectors in Capillary Electrophoresis**, in Analytical Separation Science. 2:II:11:607–628, John Wiley & Sons Ltd. First Edition. Edited by Jared L. Anderson, Alain Berthod, Verónica Pino Estévez, and Apryll M. Stalcup. 2015 Wiley-VCH Verlag GmbH & Co. KGaA. Published 2015 by Wiley-VCH Verlag GmbH & Co. KGaA. http://dx.doi.org/10.1002/9783527678129.assep038
4. Tůma P., Štulík K.: **Monitoring of Arrays of Amino Acids in Clinical Samples Using Capillary Electrophoresis with Contactless Conductivity Detection,** in Phillips T.M, Kalish H.: Clinical Applications of Capillary Electrophoresis, Methods in Molecular Biology 2013, Springer, 919, 13-23. http://dx.doi.org/10.1007/978-1-62703-029-8_2

Grants for the past five years

1. 2018-2020, GAČR, 18-04902S, **Instrumentation for continuous on-line electrophoretic monitoring of metabolic pocesses in living organisms**
2. 2017-2019, GAMA-TAČR, 20170402, **Electrophoretic instrument for clinical and environmental analysis**.
3. 2017-2019, GAČR, 17-12648S, **Tools for separation optimization in capillary electrophoresis**
4. 2015-2017, GAČR, 15-03139S, **New electrophoretic approaches to the study of obesity and diabetes**.
5. 2013-2016. TAČR, 03011027, **Innovative functional food and feed additives and with content of Omega-3 poly-unsaturated fatty acids produced by Trachydiscus minutus microalgae.**
6. 2014-2015, GAUK, 1386214, **Development of rapid electrophoretic techniques for the monitoring of metabolites in clinical samples.**
7. 2011-2013, GAUK, 389111, **Electrophoretic monitoring D-amino acids for the purposes of Neuroscience**
8. 2011-2013, GAČR, P206/11/0707, **Voltammetric assessment of new ionic liquids for their applications in capillary elctrophoresis**

9. 2010-2013, MZ0/NT, 11284, **Non-traditional application of anaesthetic drugs in disaster medicine.**

Partnership & Collaborations

1. Department of Analytical Chemistry, Faculty of Science, Charles University in Prague
2. Institute of Physics of the Czech Academy of Sciences, Department of Spintronics and Nanoelectronics
3. J. Heyrovský Institute of Physical Chemistry, Academy of Sciences of the Czech Republic, Department of Electrochemistry
4. Institute of Organic Chemistry and Biochemistry of Czech Academy of Sciences, group of Electromigration Methods
5. Privat company ADMET, development of detectors and electronic devices for analysis
6. Department of Analytical Chemistry, Faculty of Natural Sciences, Comenius University in Bratislava, laboratory of Electroseparation Methods