



Student Scientific Research Group
“Electrophoresis and Related Techniques in Drug Research and Analysis
(ECDrug)”
Academic year 2025/2026

Members:

Gabriel Hancu, PhD, professor (cordonator)

Kelemen Hajnal, PhD, professor

Aura Rusu, PhD, professor

Székely Szentmiklósi Blanka, PhD, lecturer

PhD students:

Daniela Lupu Andrei, PhD student

Alexandra Uilăcan, PhD student

Denisa Gabriela Stroia, PhD student

Student:

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Research topics:

1. Development of capillary electrophoresis methods for the determination of pharmaceutical substances from pharmaceutical preparations

- 1.1. Development of capillary electrophoresis methods for the simultaneous determination of pharmaceutical substances with similar structural and physico-chemical characteristics
- 1.2. Development of capillary electrophoresis methods for the simultaneous determination of pharmaceutical substances from fixed dose combinations
- 1.3. Development of capillary electrophoresis methods for the determination of the presence of illicit substances in adulterated dietary supplements

2. Applications of capillary electrophoresis in the analysis of chiral pharmaceutical substances

- 2.1. Cyclodextrins as chiral selectors in the enantioseparation of pharmaceutical substances by capillary electrophoresis
- 2.2. Neutral cyclodextrins vs. ionized cyclodextrins in the chiral separation of pharmaceutical substances by capillary electrophoresis
- 2.3. Method development and optimization for the separation and determination of enantiomers in pharmaceutical preparations by capillary electrophoresis
- 2.4. Application of experimental design in the development of chiral separation methods for pharmaceuticals by capillary electrophoresis
- 2.5. Verification of chiral impurities and enantiomer ratio of pharmaceuticals by capillary electrophoresis
- 2.6. High performance liquid chromatography vs. Capillary electrophoresis in modern chiral analysis

3. Applications of capillary electrophoresis in the analysis of biological samples

- 3.1. Development of capillary electrophoresis methods for determination of pharmaceutical substances from biological samples (urine, plasma).

4. Application of capillary electrophoresis in the analysis of food

- 4.1. Development of capillary electrophoresis methods for the determination of honey composition
- 4.2. Development of capillary electrophoresis methods for the determination of xenobiotics presence in honey
- 4.3. Capillary Electrophoresis as a Tool for the Characterization of Wine Components
- 4.4. Analytical Applications of Capillary Electrophoresis in the Evaluation of Wine Quality

5. Application of high performance liquid chromatography in the analysis of pharmaceutical substances

Relevant techniques:

Capillary electrophoresis (CE)

High performance liquid chromatography (HPLC)



Relevant *in extenso* ISI and BDI articles of the student scientific research team (student/PhD student name is highlighted):

ISI articles:

1. **Lupu D.** Sammani S.M. Palacio E. Hancu G. Ferrer L. *Distinctive mineral and physicochemical parameters assessment of carob honey (Mallorca Island) from Spanish honeys exploiting dimensionality reduction tools and cluster analysis*, Food Chemistry, 2025, 492(2), 1445448, doi: 10.1016/j.foodchem.2025.145448, FI: 9,80, Q1.

Food Chemistry 492 (2025) 145448



Contents lists available at ScienceDirect

Food Chemistry

journal homepage: www.elsevier.com/locate/foodchem



Distinctive mineral and physicochemical parameters assessment of carob honey (Mallorca Island) from Spanish honeys exploiting dimensionality reduction tools and cluster analysis[☆]



Daniela Lupu^{a,b}, Mohamad Subhi Sammani^a, Edwin Palacio^a, Gabriel Hancu^b, Laura Ferrer^{a,*}

2. **Lupu D.** Sammani S.M. Palacio E. Hancu G. (autor corespondent) Ferrer L. *Comprehensive honey analysis: A novel HPLC-DAD method for hydroxymethylfurfural quantification and quality evaluation via diastase activity and sugar profile determination*, Journal of Food Composition and Analysis, 2025, 137, 106925, doi: 10.1016/j.jfca.2024.106925, FI: 4,00, Q2.

Journal of Food Composition and Analysis 137 (2025) 106925



Contents lists available at ScienceDirect

Journal of Food Composition and Analysis

journal homepage: www.elsevier.com/locate/jfca



Comprehensive honey analysis: A novel HPLC-DAD method for hydroxymethylfurfural quantification and quality evaluation via diastase activity and sugar profile determination

Daniela Lupu^{a,b}, Mohamad Subhi Sammani^a, Edwin Palacio^a, Gabriel Hancu^{b,*}, Laura Ferrer^a

3. **Modroiu A.** Marzullo L. Orlandini S. Gotti R. Hancu G. Furlanetto S. *Analytical quality by design-based development of a capillary electrophoresis method for omeprazole impurity profiling*, Journal of Pharmaceutical and Biomedical Analysis. 2024, 248, 116295, doi: 10.1016/j.jpba.2024.116295, FI: 3,10 (Q2)



Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Journal of Pharmaceutical and Biomedical Analysis

journal homepage: www.journals.elsevier.com/journal-of-pharmaceutical-and-biomedical-analysis



Analytical quality by design-based development of a capillary electrophoresis method for Omeprazole impurity profiling



Adriana Modroiu^{a,b}, Luca Marzullo^b, Serena Orlandini^{b,*}, Roberto Gotti^c, Gabriel Hancu^a, Sandra Furlanetto^b

4. **Modroiu A.** Sulaiman K. Hancu G. Scriba G. *Quality by design-guided development of a capillary electrophoresis method for the chiral purity determination of silodosin*, Journal of Pharmaceutical and Biomedical Analysis, 2023, 222, 115117, doi: 10.1016/j.jpba.2022.115117, FI: 3,10 (Q2)

Journal of Pharmaceutical and Biomedical Analysis 222 (2023) 115117



Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Journal of Pharmaceutical and Biomedical Analysis

journal homepage: www.journals.elsevier.com/journal-of-pharmaceutical-and-biomedical-analysis



Quality by design-guided development of a capillary electrophoresis method for the chiral purity determination of silodosin



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5. **Modroiu A.** Sulaiman K. Hancu G. Scriba G. *Quality by design-guided development of a capillary electrophoresis method for the simultaneous chiral purity determination and impurity profiling of tamsulosin*, Journal of Separation Science, 2023; doi: 10.1002/jssc.202300604; FI: 3,10 (Q2).

DOI: 10.1002/jssc.202300604

RESEARCH ARTICLE

SEPARATION SCIENCE

Quality by design-guided development of a capillary electrophoresis method for the simultaneous chiral purity determination and impurity profiling of tamsulosin

Adriana Modroiu^{1,2} | Sulaiman Krait¹ | Gabriel Hancu² | Gerhard K. E. Scriba¹

6. **Cârcu-Dobrin M.** Hancu G. Papp L.A. Fülöp I. *Chiral discrimination of mexiletine enantiomers by capillary electrophoresis using cyclodextrins as chiral selectors and experimental design method optimization*, Molecules, 2022, 27(17), 5603, doi: 10.3390/molecules27175603, FI: 4,60 (Q2).



Article

Chiral Discrimination of Mexiletine Enantiomers by Capillary Electrophoresis Using Cyclodextrins as Chiral Selectors and Experimental Design Method Optimization

Melania Cărcu-Dobrin ^{1,†}, Gabriel Hancu ^{1,*}, Lajos Attila Papp ¹ and Ibolya Fülöp ²

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7. Orlandini S Hancu G. Szabó Z.I. **Modroiu A.** Papp L.A. Gotti R. Furlanetto S. *New trends in the quality control of enantiomeric drugs: Quality by Design-compliant development of chiral capillary electrophoresis methods*, Molecules, 2022, 27 (20), 7058, doi: 10.3390/molecules27207058, FI: FI: 4,60 (Q2)



Review

New Trends in the Quality Control of Enantiomeric Drugs: Quality by Design-Compliant Development of Chiral Capillary Electrophoresis Methods

Serena Orlandini ^{1,†}, Gabriel Hancu ^{2,*}, Zoltán-István Szabó ³, Adriana Modroiu ², Lajos-Attila Papp ², Roberto Gotti ⁴ and Sandra Furlanetto ¹

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8. Hancu G. Orlandini S. Papp L.A. **Modroiu A.** Gotti R. Furlanetto S. *Application of experimental design methodologies in the enantioseparation of pharmaceuticals by capillary electrophoresis: a review*, Molecules, 2021, 26(15), 4681, doi: 10.3390/molecules26154681, FI: 4,60 (Q2).



Review

Application of Experimental Design Methodologies in the Enantioseparation of Pharmaceuticals by Capillary Electrophoresis: A Review

Gabriel Hancu ^{1,†}, Serena Orlandini ^{2,†}, Lajos Attila Papp ^{1,*}, Adriana Modroiu ¹, Roberto Gotti ³ and Sandra Furlanetto ²

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9. Papp L.A. **Krizbai S.** Dobó M. Hancu G. Szabó Z.I. Tóth G. *Determination of chiral impurity of naproxen in different pharmaceutical formulations using polysaccharide-based stationary phases in reversed-phased mode*, Molecules, 2022, 27 (11), 2986, doi: doi.org/10.3390/molecules27092986, FI: 4,60 (Q2).



Article

Determination of Chiral Impurity of Naproxen in Different Pharmaceutical Formulations Using Polysaccharide-Based Stationary Phases in Reversed-Phased Mode

Lajos-Attila Papp¹, Sarolta Krizbai¹, Máté Dobó², Gabriel Hancu¹, Zoltán-István Szabó^{3,*} and Gergő Tóth²

10. **Cârcu-Dobrin M.** Hancu G. Papp L.A. Fülöp I. Kelemen H. *Development of a chiral capillary electrophoresis method for the enantioseparation of verapamil using cyclodextrins as chiral selectors and experimental design optimization*, Symmetry, 2021, 13, 2186, doi: 10.3390/sym13112186; FI: 2,940 (Q2)



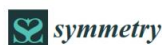
Article

Development of a Chiral Capillary Electrophoresis Method for the Enantioseparation of Verapamil Using Cyclodextrins as Chiral Selectors and Experimental Design Optimization

Melania Cârcu-Dobrin^{1,*}, Gabriel Hancu¹, Lajos Attila Papp¹, Ibolya Fülöp² and Hajnal Kelemen¹

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11. **Milan A.** Hancu G. Lupu D. **Budău M.** Garaj V. Kelemen H. *Venlafaxine chiral separation by capillary electrophoresis using cyclodextrin derivatives as chiral selector and experimental design method optimization*. Symmetry, 2020, 12(5):849, FI: 2,645 (Q2).



Article

Venlafaxine Chiral Separation by Capillary Electrophoresis Using Cyclodextrin Derivatives as Chiral Selector and Experimental Design Method Optimization

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12. **Budău M.** Hancu G. Muntean D.L. Papp L.A. Cârje A. Garaj V. *Enantioseparation of citalopram enantiomers by capillary electrophoresis: method development through experimental design and computational modelling*. Chirality, 2020, 32(8): 1119-1128; doi: 10.1002/chir.23255, FI: 2,437 (Q2)

REGULAR ARTICLE

WILEY

Enantioseparation of citalopram enantiomers by capillary electrophoresis: Method development through experimental design and computational modeling

Monica Budău¹ | Gabriel Hancu¹ | Daniela Lucia Muntean² |
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13. **Papp L.A.** Foroughbakhshfasaei M. Fiser B. Horváth P. Kiss E. Sekkoum K. Gyéresi Á. Hancu G. Noszál B. Szabó Z.I. Tóth G. *Reversed-phase HPLC enantioseparation of pantoprazole using a teicoplanin aglycone stationary phase – Determination of the enantiomer elution order using HPLC-CD analyses.* Chirality, 2020, 32(2): 158-167; doi: 10.1002/chir.23146, FI: 2,437 (Q2)
14. **Cârcu-Dobrin M. Sabău A.** Hancu G. Gyéresi Á. Rusu A. Kelemen H. Papp LA. Cârje A. *Chiral discrimination of amlodipine from pharmaceutical products using capillary electrophoresis.* Brazilian Journal of Pharmaceutical Sciences, 2020, 56:e18259, FI: 0,814.
15. **Papp L.A.** Hancu G. Gyéresi Á. Kelemen H. Szabó Z.I. Noszál B. Dubský P. Tóth G. *Chiral separation of lansoprazole and rabeprazole by capillary electrophoresis using dual cyclodextrin systems.* Electrophoresis, 2019, 40: 2799-2805; doi: 10.1002/elps.201900107, FI: 3,081 (Q2)

Electrophoresis 2019, 00, 1–7

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Research Article

Chiral separation of lansoprazole and rabeprazole by capillary electrophoresis using dual cyclodextrin systems

16. **Sarkany A.** Hancu G. Cârje A. **Drăguț C.** Papp LA. *Chiral separation of tramadol enantiomers by capillary electrophoresis using cyclodextrins as chiral selectors and experimental design method optimization.* Chemical Papers, 2019, 73, 2363-2370, FI: 1,246.

Chemical Papers (2019) 73:2363–2370
<https://doi.org/10.1007/s11696-019-00789-8>

ORIGINAL PAPER



Chiral separation of tramadol enantiomers by capillary electrophoresis using cyclodextrins as chiral selectors and experimental design method optimization

Anita Sarkany¹ · Gabriel Hancu¹ · Anca Cârje² · Claudiu Drăguț¹ · Lajos Attila Papp¹

17. **Papp L.A.** Gyéresi Á. Hancu G. Mircia E. Kelemen H. *Development of a generic method for the determination of proton-pump inhibitors by capillary zone electrophoresis.* Brazilian Journal of Pharmaceutical Sciences, 2019, 55: e17786; doi: 10.1590/s2175-97902019000117786, ISSN 1984-8250, eISSN 2175-9790, FI: 0,814.
18. Hancu G. **Toncean A.** Podar D. **Sarkany A. Drăguț C.** Barabás E. *Simultaneous determination of anthelmintic drugs by capillary electrophoresis using cyclodextrins as buffer additives.* SN Applied Sciences, 2019, 1:478.
19. **Cârcu-Dobrin M. Budău M.** Hancu G. Gagyí L. Rusu A. Kelemen H. *Enantioselective analysis of fluoxetine in pharmaceutical formulations by capillary zone electrophoresis.* Saudi Pharmaceutical Journal, 2017, 25, 397-403, FI: 3,11 (Q2).
20. **Budău M.** Hancu G. Szabó ZI. Kelemen H. Rusu A. Muntean DL. Cârje AG. *Captisol® as chiral selector in capillary electrophoresis of non-acidic drugs.* Journal of the Chilean Chemical Society, 2017, 62(3):3566-3571, FI: 0,463.



ORIGINAL ARTICLE

Enantioselective analysis of fluoxetine in pharmaceutical formulations by capillary zone electrophoresis



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21. Stăcescu Ș. Hancu G. Gagyi L. Soare R.M. Kelemen H. *Simultaneous determination of hydrochlorthiazide and telmisartan from pharmaceutical preparations using capillary electrophoresis*. Studia Chimica UBB, 2017, LXII, 2, 189-198, FI: 0,305.
22. Mircia E. Hancu G. Nițu O. Kelemen H. Cârcu-Dobrin M. Gâz ȘA. Balaci T. *Simultaneous determination of fibrates by micellar electrokinetic capillary chromatography*. Farmacia, 2017, 65(1), 109-113, FI: 1,507.
23. Hancu G. Neacșu A. Papp LA. Ciurba A. *Simultaneous determination of amoxicillin and clavulanic acid in pharmaceutical preparations by capillary electrophoresis*. Brazilian Journal of Pharmaceutical Sciences, 2016, 52(2): 281-286, FI: 0,474.
24. Hancu G. Hilochie A. Vlad RA. Cârje A. Tero-Vescan A., *Enantiomeric separation of sibutramine by capillary zone electrophoresis*. Journal of the Brazilian Chemical Society, 2016, 26(7): 1116-1120, FI: 1,198.
25. Modroiu A. Hancu G. Vlad RA. Stăcescu Ș. Soare R. Kelemen H. *Simultaneous determination of amlodipine and telmisartan from pharmaceutical products by capillary electrophoresis*, Current Issues in Pharmacy and Medical Sciences. 2016. 29(1): 42-45.
26. Szabó Z.I. Tóth C. Hancu G. Muntean DL., *Simultaneous chiral separation of four H1-antihistamines by capillary zone electrophoresis using a dual cyclodextrin system*, Chromatographia, 2015, 78(21): 1377-1384, doi: 10.1007/s10337-015-2967-y, FI: 1,332.
27. Hancu G. Papp LA. Rusu A., *Chiral separation of the enantiomers of omeprazole and pantoprazole by capillary electrophoresis*. Chromatographia, 2015, 78: 279-284, FI: 1,332.
28. Hancu G. Cârje A. Iuga I. Fülöp I. Szabó Z.I. *Cyclodextrine screening for the chiral separation of carvedilol by capillary electrophoresis*. Iranian Journal of Pharmaceutical Research, 2015, 14(2): 425-433, FI: 1,352.
29. Hancu G. Sasebeși A. Rusu A. Kelemen H. Ciurba A. *Study of the electrophoretic behavior of cephalosporins by capillary zone electrophoresis*. Advanced Pharmaceutical Bulletin, 2015, 5(2): 223-229.
30. Hancu G. Budău M. Kántor L.K. Cârje A. *Cyclodextrine screening for the chiral separation of amlodipine enantiomers by capillary electrophoresis*. Advanced Pharmaceutical Bulletin, 2015, 5(1): 35-40.



31. Hancu G. **Sămărghițan C.** Rusu A. Mircia E. *Sotalol chiral separation by capillary electrophoresis*. Journal of Chilean Chemical Society 2014, 59(3): 2559-2562, FI: 0.469.
32. Ciurba A. Hancu G. **Cojoccea L.** Sipos E. Todoran N. *Development of new formulation and its evaluation by capillary electrophoresis of tablets containing tramadol hydrochloride and paracetamol*. Pharmaceutical Development and Technology 2014, 19(7): 833-838, FI: 1.335.
33. Hancu G. Rusu A. Simon B. **Boia G.** Gyéresi Á. *Simultaneous separation of ciprofloxacin, norfloxacin and ofloxacin by micellar electrokinetic chromatography*. Journal of Brazilian Chemical Society 2012, 23(10): 1889-1894, FI: 1.283.

Papers presented at scientific meetings by students member of the scientific research group (student/PhD student name is highlighted):



1. Mircia E. **Uilăcan A.** Hancu G. *Aplicarea cromatografiei capilare electrocinetice micelare la determinarea rapidă a fibraților structural înrudiți (Micellar electrokinetic capillary chromatography approach for the rapid determination of structurally related fibrates)*, Congresul Național de Farmacie, ediția a XX-a, Târgu Mureș, 24-26 septembrie, 2025, volum de rezumate, 58, ID: 232.
2. **Uilăcan A.** Rusu A. Hancu G. *Compușii polifenolici din vinul roșu: compoziție, impact asupra sănătății, perspective (Polyphenolic Compounds in Red Wine: Composition, Health Impacts, Perspectives)*, Congresul Național de Farmacie, ediția a XX-a, Târgu Mureș, 24-26 septembrie, 2025, volum de rezumate, 143, ID: 212 - – **premiul II.**

23rd International Symposium and Summer School on Bioanalysis

3. **Uilăcan A.** Kelemen H. Székely-Szentmiklósi B. Hancu G. *Electrophoretic and chromatographic approaches to wine polyphenol analysis: advances in profiling, quality assessment, and authentication*, 23rd International Symposium and Summer School on Bioanalysis, 6-15 Iulie 2025, Zagreb (Croatia), Book of Abstracts, 98.

21st INTERNATIONAL SYMPOSIUM AND SUMMER SCHOOL ON BIOANALYSIS (21STISSB)

10-15 July 2023
Târgu Mureș, Romania

4. **Modroiu A.** Hancu G. Marzullo L. Orlandini S. Gotti R. Furlanetto S. *Development of a capillary electrophoresis method for the impurity profiling of omeprazole using quality by design*



methodology, 21st International Symposium and Summer School on Bioanalysis (21stISSSB), 10-15 Iulie 2023, Târgu Mureș, Acta Medica Marisiensis, 69(S5): 27.

5. **Papp L.A.** Székely-Szentmiklósi B. Szabó Z.I. Tóth G. Kraszni M. Hancu G. Determination of enantiomeric purity of vildagliptin by capillary electrophoresis, 21st International Symposium and Summer School on Bioanalysis (21stISSSB), 10-15 Iulie 2023, Târgu Mureș, Acta Medica Marisiensis, 69(S5): 31.

6. **Lupu D.** Hancu G. Antibiotics, as xenobiotic residues in honey – a health hazard, 13th Conference of PhD students and young doctors, 7-11 Decembrie 2020, Târgu Mureș, Book of abstracts, 77

7. **Milan A.** Hancu G. Venlafaxine enantioseparation by capillary electrophoresis using cyclodextrins as chiral selectors and experimental design method optimization, Marisiensis, 25-29 martie 2020, Acta Medica Marisiensis, 66(3); 77.



8. **Sarkany A.** Drăguț C., Hancu G. Method development through experimental design for the separation of tramadol enantiomers by cyclodextrin mediated capillary electrophoresis, Marisiensis, 27-31 Martie, 2019, Acta Medica Marisiensis, 65(1), 57 – **cea mai bună lucrare experimentală**



National Congress of
Pharmacy in Romania
17th edition, 2018

9. **Sarkany A.** Drăguț C. Toncean A. Gagyí L. Hancu G. Determinarea unor substanțe antihelmintice prin electroforeză capilară, Congresul Național de Farmacie, ediția a XVII-a, 26-29 septembrie, 2018, București, Book of abstracts, ID 68



10. **Cârcu-Dobrin M.** Budău M. Hancu G. Kelemen H. Rusu A. Separarea chirală a fluoxetinei prin electroforeză capilară utilizând ciclodextrine ca și selectori chirali (Chiral discrimination of fluoxetine enantiomers by capillary electrophoresis using cyclodextrins as chiral selectors), Congresul Național de Farmacie București, 28 septembrie – 1 octombrie 2016, volum de rezumate, ID 45



11. **Stăcescu Ș.** Hancu G. Soare R. Rusu A. Szekey-Szentmiklosi B. Gagy L. Determinarea simultană a hidroclortiazidei și a telmisartanului din forme farmaceutice prin electroforeză capilară (Simultaneous determination of hydrochlorothiazide and telmisartan from pharmaceutical products by capillary electrophoresis), Congresul Național de Farmacie București, 28 septembrie – 1 octombrie 2016, volum de rezumate, ID 51.

12. Budău M. **Uilăcan A.** Papp LA. Hancu G. Kelemen H. Muntean DL. Separarea chirală a venlafaxinei prin electroforeză capilară utilizând un sistem dual de ciclodextrine (Venlafaxine chiral separation by capillary electrophoresis using a dual cyclodextrine system), Congresul Național de Farmacie București, 28 septembrie – 1 octombrie 2016, volum de rezumate, ID 52 – **cel mai bun poster al secțiunii.**



13. **Uilăcan A.** Moldovan A. Hancu G. Budău M. Venlafaxine chiral separation by capillary electrophoresis using a dual cyclodextrin system, International Congress for Students, Young Physicians and Pharmacists, Marisiensis, Tîrgu Mureș, 30 martie – 3 aprilie, 2016, Acta Medica Marisiensis, 62(4): 86.

14. **Stăcescu Ș.** Hancu G. Simultaneous determination of telmisartan and hydrochlorothiazide by capillary electrophoresis, International Congress for Students, Young Physicians and Pharmacists, Marisiensis, Tîrgu Mureș, 30 martie – 3 aprilie, 2016, Acta Medica Marisiensis, 62(4): 87.

15. **Cârcu-Dobrin M.** Hancu G. Budău M. Chiral determination of cetirizine enantiomers from pharmaceutical products by capillary electrophoresis, International Congress for Students, Young Physicians and Pharmacists, Marisiensis, Tîrgu Mureș, 30 martie – 3 aprilie, 2016, Acta Medica Marisiensis, 62(4): 88 – **premiul II**

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