

LABORATORY OF ANTIBIOTIC RESISTANCE AND APPLICATIONS OF MASS SPECTROMETRY IN MICROBIOLOGY



ABOUT US

Scientific activities of Laboratory of Antibiotic Resistance and Application of Mass spectrometry in Microbiology (ARAMM) are mainly focused on mechanisms of resistance to antibiotics, especially to expanded-spectrum cephalosporins and carbapenems, in Gram-negative bacteria (Enterobacteriaceae, Pseudomonas spp.). The research projects aim to execute molecular epidemiology of factors affecting dissemination of multi-drug resistance among nosocomial pathogens. Methodological approaches, also, include analysis of genetic carriers of resistance determinants and whole-genome sequencing. The second main objective of the research projects is intending in the development of new techniques for the detection and study of resistance mechanisms using MALDI-TOF mass spectrometry and Raman spectroscopy. In 2011, the members of our group demonstrated that MALDI-TOF mass spectrometry can directly detect carbapenemase activity. Also, recently, we patented a method for the identification of β -lactamases in clinical isolates by MALDI-TOF mass spectrometry, based on their molecular weight.

MEMBERS

- **Constantinos C. Papagiannitsis, Ph.D. – Research Group Leader**
- Assoc. Prof. Jaroslav Hrabák, Ph.D., M.Sc.
- Monika Dolejská, Ph.D., M.Sc.
- Vendula Heringová, M.Sc.
- Eva Chudáčková, M.D.
- Kateřina Chudějová, M.Sc.
- Anna Skálová, M.D.
- Dana Králová, DiS.

WE OFFER

- DNA sequencing, including capillary and whole-genome sequencing, and metagenomic analysis.
- Molecular typing of Gram-negative bacteria.
- Detection of resistance mechanisms in Gram-negative bacteria (β -lactamases, mechanisms of resistance in fluoroquinolones, aminoglycosides, colistin, etc.).
- Applications of mass spectrometry in microbiology.
- Applications of Raman spectroscopy in microbiology.

SELECTED PUBLICATIONS

- Hrabák J., Papagiannitsis C.C., Chudáčková E. Detection of carbapenemases in Enterobacteriaceae: a challenge for diagnostic microbiological laboratories. *Clinical Microbiology and Infection* 20, 2014: 839-853. DOI: 10.1111/1469-0691.12678
- Papagiannitsis C.C., Kotsakis S.D., Tuma Z., Gniadkowski M., Miriagou V., Hrabak J. Identification of CMY-2-type cephalosporinases in clinical isolates of Enterobacteriaceae by MALDI-TOF MS. *Antimicrobial Agents and Chemotherapy* 58 (5), 2014: 2952 - 2957. DOI: 10.1128/AAC.02418-13
- Hrabák J., Papagiannitsis C.C., Študentová V., Jakubů V., Fridrichová M., Žemličková H. and Czech Participants of European Antimicrobial Resistance Surveillance Network. First outbreaks of carbapenemase-producing *Klebsiella pneumoniae* in the Czech Republic in 2011. *Eurosurveillance* 2013; 18(45):pii=20626
- Papagiannitsis C.C., Studentova V., Hrabak J., Kubele J., Jindrák V., Zemlickova H. Isolation from a non-clinical sample of a *Leclercia adecarboxylata* producing a VIM-1 metallo- β -lactamase. *Antimicrobial Agents and Chemotherapy* 57, 2013: 2896 – 2897. DOI: 10.1128/AAC.00052-13
- Hrabák J., Studentová V., Walková R., Zemlicková H., Jakubu V., Chudáčková E., Gniadkowski M., Pfeifer Y., Perry J.D., Wilkinson K., Bergerová T. Detection of NDM-1, VIM-1, KPC, OXA-48, and OXA-162 carbapenemases by MALDI-TOF mass spectrometry. *Journal of Clinical Microbiology* 50, 2012: 2441 – 2443, DOI: 10.1128/JCM.01002-12
- Hrabák J., Walková R., Študentová V., Chudáčková E., Bergerová T. Carbapenemase Activity Detection by Matrix-Assisted Laser Desorption/Ionisation Time-of-Flight Mass Spectrometry. *Journal of Clinical Microbiology* 49, 2011: 3222 - 3227; DOI: 10.1128/JCM.00984-11

PATENT

- PV2013-473 / Nr. 304833 Method of Detection of Gram-negative Bacteria Periplasmic Space and Cell Wall Outer Membrane Proteins by Mass Spectrometry – Czech National Patent.

