

UNIVERSITATEA TITU MAIORESCU DIN BUCUREȘTI

ȘCOALA DOCTORALĂ

DOMENIUL MEDICINĂ

TEZĂ DE ABILITARE

Candidat:

Dr. Mihaela Magdalena Mitache

Conferențiar universitar

București, 2026

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**Contemporary Challenges in Clinical, Environmental, and Translational
Microbiology: Antimicrobial Resistance, Microbial Virulence, Infectious
Diseases, and the Human Microbiome**

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SUMMARY OF THE HABILITATION THESIS

SECTION 1. SCIENTIFIC, PROFESSIONAL, AND ACADEMIC ACHIEVEMENTS

I, **Mihaela Magdalena Mitache**, began my professional activity in 1999 within the Laboratory of Diagnosis and Research in Public Health of the Bucharest Public Health Directorate. I have gained extensive experience in clinical bacteriology, sanitary microbiology, parasitology, and virology, contributing to the implementation of laboratory quality standards and to national-level epidemiological investigations.

I continued my academic and scientific career by obtaining a PhD in biology in 2010, followed by constant involvement in research, university teaching, and coordination of practical and didactic activities within medical study programs.

TEACHING ACTIVITY

As a university lecturer, I have conducted over 15 years of continuous academic activity in teaching Oral Microbiology, Bacteriology, Virology, and Parasitology at the Faculties of General Medicine and Dental Medicine. The teaching process has been complemented by hands-on laboratory practice, supervision of bachelor's and master's theses, and development of educational materials adapted to new curricular requirements. I have developed and taught courses for Romanian and international students, in both Romanian and English, aligned with international standards in medical higher education.

RESEARCH ACTIVITY

I have been involved in both national and international research projects, as member or principal investigator within interdisciplinary research teams. The results of my scientific activity have been published in ISI-ranked or BDI-indexed journals and presented at international scientific events.

The main research directions included:

- evaluation of antimicrobial resistance and virulence potential in bacteria isolated from clinical and environmental sources;
- development of rapid methods for identifying resistance genotypes;

- studies on bacterial intercellular communication and the role of signaling molecules in the regulation of virulence expression;
- analysis of microorganism-host cell interaction through in vitro and in vivo experimental models;
- application of nanotechnology and biopolymers in the development of innovative antibiotic delivery systems.

Research Areas Addressed:

My research has focused on:

- bacterial antimicrobial resistance and pathogenicity mechanisms of clinically relevant microorganisms, including the molecular investigation of antimicrobial resistance and virulence markers;
- healthcare-associated infections and microbiological contamination of the hospital environment, with a focus on the dissemination and persistence of multidrug-resistant microorganisms, including ESKAPE pathogens;
- microbial virulence and its relationship with environmental factors, selective pressures, and host–microorganism interactions;
- translational microbiology, through an integrated approach to the interfaces between clinical settings, the environment, and the food chain, within the One Health framework;
- development and evaluation of innovative antimicrobial and antivirulence strategies, including synthetic chemical compounds, plant extracts and essential oils, nanoparticles, biopolymers, biomaterials, and alloys with antimicrobial potential;
- evaluation of the efficacy of chemical disinfectants against antibiotic-resistant microorganisms and investigation of the impact of selective pressures on antimicrobial resistance and pathogenicity profiles;
- viral infections and pandemic response, with a focus on SARS-CoV-2 infection, immunological and seroepidemiological assessment, as well as clinical, inflammatory, and prognostic factors associated with severe COVID-19, including in vulnerable populations;
- the human microbiome and site-specific microbiota in health and disease, with a focus on antibiotic response, respiratory diseases, and cancer-related processes, including the

use of modern metagenomic approaches and the exploration of potential therapeutic implications.

SECTION 2. CAREER DEVELOPMENT PLANS

Research Directions to Be Developed:

In the post-habilitation stage, I aim to extend the current research directions through:

- Development of rapid molecular diagnostic methods for antimicrobial resistance, particularly for Gram-negative bacteria involved in nosocomial infections;
- Development of natural antimicrobial compounds and nanotechnology-based formulations, in collaboration with multidisciplinary teams (chemistry, bioengineering);
- Study of host-pathogen interactions using experimental models such as *Drosophila melanogaster*, to detect immunological and transcriptomic responses induced by bacterial signaling molecules;
- Analysis of microbial dysbiosis in pathological contexts and evaluation of probiotic or therapeutic interventions on the human microbiome;
- Expansion of editorial activity, through the publication of academic textbooks dedicated to Oral Microbiology, Bacteriology, Parasitology, and Virology, addressed to students of Medicine and Dental Medicine.
- I aim to consolidate a competitive research group, to attract motivated students into research activities, to develop international collaborations, and to access new funding sources by participating in national and European projects (PNRR, Horizon Europe).