

**UNIVERSITATEA TITU MAIORESCU DIN BUCUREȘTI**

**ȘCOALA DOCTORALĂ**

**DOMENIUL MEDICINĂ**

**TEZĂ DE ABILITARE**

**Candidat:**

**Dr. Mihaela Magdalena Mitache**

**Conferențiar universitar**

**București, 2025**

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**Bridging Clinical and Environmental Microbiology: Resistance Mechanisms and  
Virulence Features in Pathogens of Public Health Concern**

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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 microbiology 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 Medical Microbiology, 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 resistance to antibiotics, including through rapid molecular methods (e.g., PCR);
- microbial virulence, in correlation with environmental conditions and selective pressures;
- development of alternative antimicrobial strategies, including the use of plant extracts, nanoparticles, and biopolymers;
- microbiome studies (oral, intestinal, skin) in correlation with health and disease, using modern metagenomic approaches.

## **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 Medical Microbiology, 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).