

Fundamental research in the medical field: from microbiology to molecular biology

Habilitation Thesis

Conf. Dr. Mihaela Laura Vică

ABSTRACT

Basic research in the medical field holds significant importance as it brings new, clear, and evidence-based information not only regarding various conditions but also concerning the risk factors that can endanger human health. Medical fundamental research, complementary to other research areas within the field of medicine, offers new perspectives that carry immense social value in terms of public health.

The habilitation thesis titled "*Fundamental research in the medical field: from microbiology to molecular biology*" succinctly presents the results of scientific activities as well as the professional and academic achievements following the attainment of the Doctor of Medicine title in 2011, obtained after defending the PhD thesis entitled "*The importance of microbiological exam for food safety*".

As microbiological contamination of food can be a major cause of illness, my PhD thesis, following several lines of research, microbiologically evaluated different food products considered to be at high risk of food poisoning and investigated the factors involved in microbiological contamination of food and the environment. Later, my postdoctoral research continued this line on the study of contamination of drinking water, soil, and the environment, this being the first of the research directions presented in the habilitation thesis. I conducted research to determine the quality of drinking water sources in different regions, performing comparative studies through parallel monitoring of various quality indicators, with the aim of documenting local sources of pollution and identifying risk areas. Additionally, I evaluated certain external biological factors that could influence the microbiological contamination of certain objects, potentially impacting the health of individuals who come into contact with them.

Another direction of research also continued some studies initiated during the work to the PhD thesis, specifically focusing on the antibacterial properties of certain natural products. In this regard, I assessed the activity of various types of honey against antibiotic-resistant bacterial strains, investigated the antibacterial and antifungal activity of certain propolis extracts, seeking correlations between their origin and antimicrobial efficacy, and analyzed the synergistic antimicrobial effects of some honey and propolis samples.

The other two lines of research presented in the habilitation thesis, both employing molecular biology techniques, were initiated after receiving the PhD title but continued in the same direction, being mainly related to the field of microbiology. Thus, one of these research directions entailed investigations into sexually transmitted infections (STIs), encompassing the prevalence of certain genotypes of the *Human papillomavirus* (HPV), molecular diagnostics of

pathogens responsible for STIs, and assessment of antibiotic resistance among certain agents causing STIs through molecular diagnosis. As a continuation of the previous line of research, I further explored the antibacterial activity of specific propolis extracts against bacterial STI pathogens.

The final research direction presented refers to association studies between the Human Leukocyte Antigen (HLA) and various infections, pathologies, behaviors, or mental states. In this segment, I briefly outlined several representative studies conducted within this domain: an investigation of the polymorphisms of HLA alleles within the population of Transylvania, followed by examinations of associations between HLA alleles and the hepatitis B virus, the SARS-CoV-2 virus, and the influence of HLA alleles on affective distress profiles.

All research presented above, along with additional studies conducted after the defense of the PhD Thesis, which are not outlined in the habilitation thesis, have materialized in numerous scientific publications. They have been disseminated at various scientific conferences and events, some of them being the subject of research projects of which I was a member or project director.

The habilitation thesis also highlights my professional accomplishments, detailing my work as a biologist in microbiology and molecular biology laboratories and the skills I have acquired through these experiences, which have been instrumental in my professional development. Currently, my professional activity is carried out within the Serology and Molecular Biology Complementary Examinations Laboratory of the Institute of Legal Medicine in Cluj-Napoca.

The next subchapter of the habilitation thesis presents academic achievements: the teaching activity carried out in the Discipline of Cell and Molecular Biology within the Faculty of Medicine, "Iuliu Hațieganu" University of Medicine and Pharmacy in Cluj-Napoca, as Assistant Professor, Lecturer, and currently as Associate Professor, the research activity within the Discipline, guiding students in completing their undergraduate and master's theses, the Student Scientific Circle, as well as coordinating the Master's program "Advanced Research in Forensic Investigation and Forensic Medicine" as director.

The final part of the habilitation thesis presents the career development plans from a scientific, professional, and academic perspective. This section describes the strategies pursued for continuing the fundamental research initiated and addressing new research topics, continuing professional activities to the highest performance standards, as well as continuing and improving teaching activities and future coordination of doctoral theses.