

**"VICTOR BABEȘ" UNIVERSITY OF  
MEDICINE AND PHARMACY TIMIȘOARA  
DOCTORAL SCHOOL  
MEDICINE**



**CONTRIBUTIONS BASED ON BIOLOGICAL  
ASSESSMENTS FOR THE MAINTENANCE OF  
PUBLIC HEALTH AND THE ENVIRONMENT**

**ABSTRACT**

**Associate professor PhD Carabă Marioara Nicoleta**

**Timișoara  
2024**

The present thesis entitled "**Contributions based on biological assessments for the maintenance of public health and the environment**" represents a synthesis of the research work carried out starting with the post-doctoral period and a presentation of my academic and professional activity.

The scientific research is oriented in three directions of major importance at the present time, namely, the effects of heavy metals and mycotoxins on various biological parameters quantified in vivo, distribution of heavy metals in soil and water and their ecological impact, and testing natural and synthetic compounds in order to identify the antibacterial and antiproliferative potential.

It is well known that xenobiotics are chemicals foreign to living organisms, for example chemically synthesized compounds (eg drugs, pesticides, dietary supplements) that are not natural and not produced by living organisms. Endobiotics are naturally occurring chemicals that can easily become xenobiotics when present in the environment in very high concentrations. Xenobiotics are mainly produced as a result of different types of human activities, but there are some organisms that can synthesize them as part of their defense system (mycotoxins or toxins of bacterial or fungal origin). These substances are ubiquitous, the exposure of the human body to xenobiotics is inevitable and sometimes voluntary, due to possible beneficial effects on human health (medicines, antioxidants, etc.).

The research activity took into account the way in which the bioaccumulation of these substances takes place and how the transfer of substances is carried out at the level of the food chain. The objectives of these studies were to carry out a general assessment of the risks generated by exposure to xenobiotics and their bioaccumulation, in order to accurately and correctly assess the risks and their cascading effects at the biological level.

The ecological state and the quality of water and soil are essential for a balanced biological development. Thus, the second direction of the research followed microbiological studies to establish the quality of water, soil, and air. Assessing the quality of surface waters based on microbiological analyses, establishing the quality of surface waters and identifying possible sources of pollution was the first concern in the field. The analyzes carried out had in mind the establishment of the degree of chemical and biological pollution (fecal pollution), respectively the identification of the sources of water contamination, aspects viewed from the perspective of the effect that the polluting compounds would have on animal and human health. Soil quality was

assessed based on analyzes that allow the identification of the population of prokaryotic cells and biochemical analyses, as it directly influences agricultural activity and productivity. Agricultural production is influenced by the state of soil fertility, this productivity is valued both quantitatively and qualitatively.

Establishing the quality of food products is based on specific laboratory analyzes that determine the presence/absence and quantity of some contaminants such as: pesticides, products resulting from the metabolism of pesticides, nitrogen compounds, heavy metals, which can be found in agricultural products, and following consumption they can influence the health of animals and people. Assessing air quality based on microbiological analyzes is an important aspect considering the microaeroflora, since the atmosphere does not have its own flora, in the sense of the existence of microorganisms whose specific living environment is the air, but it permanently contains prokaryotic cells from the soil, from water, vegetation or human or animal organisms. Air quality is important for human pathology, especially to the extent that the prokaryotic organisms present can constitute allergens, the air being the way of transmission of these diseases, pathologies that are common in human communities.

The last direction of research is focused on the activity of biologically active or synthetic compounds on prokaryotic and eukaryotic cells. Biological compounds and synthetic compounds are of real interest from the perspective of discovering new therapeutic approaches for different types of pathologies. Their acquisition, characterization and testing are important preliminary steps to preclinical studies.

Antibacterial substances play a vital role in the treatment of bacterial infections, which continue to pose a major global health problem. Given the emergence of antibiotic-resistant bacteria, the identification of new antibacterial agents is of utmost importance. Compounds possessing strong antibacterial properties can effectively fight infections and enhance the well-being of patients. In the field of agriculture, antimicrobial substances are employed to manage bacterial, fungal, and other pathogenic diseases in plants. By impeding the growth of plant pathogens, these substances safeguard crop productivity and guarantee food security. Antiproliferative compounds play a critical role in cancer treatment by inhibiting the growth and spread of cancer cells. Screening natural or synthetic compounds for their ability to inhibit microbial activity or cancer cell proliferation can lead to the discovery of novel therapeutic agents with improved efficacy and safety profiles.

Throughout my research career, I have carried out specialized studies both on natural compounds (different types of plant or animal extracts) and on synthetic compounds. We obtained, characterized and tested in vitro on prokaryotic cells (standardized bacterial and fungal strains, bacterial and fungal strains isolated from patients with various pathologies, antibiotic-resistant bacterial strains) and eukaryotic cells (2D cell culture system) and in vivo certain plant extracts and I also focused my attention on certain synthetic compounds of interest such as ionic liquids, which show antimicrobial and antitumor potential, thus implications in the medical sphere.

In summary, the scientific activity during the post-doctoral period resulted in the publication of 37 ISI articles in extenso, of which 22 ISI articles as the main author and 15 ISI articles as a co-author. Also, 10 ISI Proceedings articles were published including 3 articles as lead author and 7 articles as co-author. The 37 ISI in extenso articles were published in journals classified in the red zone (Q1): 8 articles of which 5 as main author and 3 as co-author; yellow zone (Q2): 3 articles of which 2 as main author and 1 article as co-author, respectively white (Q3) 27 articles. Also, part of the research results were published in 73 scientific papers in journals indexed in international databases (BDI).

Thus, the results of the research activity were disseminated in the academic and socio-economic environment through 94 papers presented and published in the volumes of national and international conferences, the presentation being oral or poster. These results are due of my involvement in research projects: 4 research projects as project director: 1 national project from National Council for Scientific Research in Higher Education (CNCSIS) and 3 research projects with the public/private economic environment, respectively 3 research projects as a member: 1 international project Romania-Serbia and 2 projects with the public/private economic environment. The Web of Science Profile page has a total of 55 publications, a total of 162 citations without self-citations and an H-index of 10.

The research activity was carried out to a small extent individually, the most valuable research results were obtained in collaboration with several research teams, both within the Western University of Timișoara and with research teams from partner universities. The research activity carried out at the Western University of Timișoara was carried out in collaboration with colleagues from the research center within the Advanced Environmental Research Laboratories, of which I am a member. I collaborate with groups of researchers from other universities: the University of Life

Sciences "Regele Mihai I" of Romania in Timișoara, the University of Medicine and Pharmacy "Victor Babeș" Timișoara, Politehnica University Timișoara. I am also a member of the ANAPATMOL Research Center within the University of Medicine and Pharmacy "Victor Babeș" Timisoara.

The second chapter is based on academic achievement. In 1995 I graduated from Industrial School Group "Mihai Viteazul" Ineu, real profile, majoring in Biology-Chemistry. I was admitted to the Faculty of Chemistry, Biology, Geography, within the framework of the Western University of Timisoara, majoring in Biology, which I graduated in 2000. I followed my doctoral studies at the Babeș-Bolyai University Cluj Napoca, obtaining the title of doctor in biology in 2007. I followed the Master's studies in Biology and Developmental Genetics at the Western University of Timisoara, Faculty of Chemistry, Biology, Geography during 2007-2009.

In 2014, I graduated from the Faculty of Animal Husbandry and Biotechnology, specializing in animal husbandry, from the University of Life Sciences "Regele Mihai I" in Timisoara. These studies prepared me for the didactic activity, so that it has been materialized through the publication of 2 course books and 3 practical work guides intended for undergraduate students, for the subjects of General Microbiology and Animal and Human Physiology.

We have supported, promoted and will promote students with exceptional performances, by encouraging them to present their own research results at specialized congresses and symposia (the Annual Conference BIOLOGIA Biological Processes - Theoretical Aspects and Applications Practice, Young people and multidisciplinary research in applied life sciences, Annual Scientific Session of the Romanian Society for Cells Biology, etc). In this sense, I coordinated 39 students who presented the results of their own research at national and international scientific events.

I have involved students in research activities since the experimental/practical part of the final studies, in this sense I have coordinated 160 Bachelor's and Dissertation papers.

I have been involved in the organization of scientific events dedicated to students, master's students, young researchers: the RSBC Annual Scientific Session and the International Cell Biology Congress (2013), the BIOLOGIA Annual Conference 10th edition Biological processes theoretical aspects and practical applications (2017-

2023), but also workshops: Cell Cultures - Theoretical Aspects and Medical Implications (2019, 2023).

I also participated as a lecturer in 3 postgraduate courses organized by UMFVBT: Stem cell isolation and cultivation techniques, Theoretical and practical course of STEM cell isolation and cultivation techniques, therapeutic applications, Theoretical and practical course of techniques of in vitro cell cultivation in 2D and 3D systems.

Regarding my professional activity, from 2017 until now, I have been employed as a head biologist at Stem Cells Bank-MedLife based in Timișoara. Together with the team we carry out activities specific to such a laboratory with a medical profile: isolation and storage of stem cells isolated from biological material collected at birth. We use state-of-the-art equipment (Sepax2 automatic processing system), but I am constantly concerned about complementing it with high-performance and state-of-the-art equipment and technologies, which would allow us to develop modern and precise molecular analysis methods. Also, another concern is the optimization of the work protocols and their accreditation by the relevant national agencies (National Transplant Agency-ANT).

The last chapter is based on academic and scientific perspectives. The evolution and development plan of my university teaching and scientific research career involves the achievement of the following objectives:

- The development of skills and abilities in the field of cell biology, as well as in related fields to ensure a more effective interdisciplinary integration of knowledge and skills, both in the activity didactic as well as research.
- The acquisition of new skills, knowledge and competences in terms of teaching and research activities, through active and continuous documentation.
- Enrichment, testing, application and consolidation of abilities and knowledge acquired through experience in teaching and research activities.
- The development of skills and competencies specific to teaching activities and the concurrent evolution in teaching functions in accordance with one's own skills and results, as well as with existing opportunities.
- Individualization and personalization of the educational process
- Diversification of both teaching and experimental activities in the cell biology discipline

- Use of modern teaching aids for courses and seminars, and modern techniques for laboratories. Development of appropriate and up-to-date knowledge transfer supports, classic and/or electronic.
- Adapting the scientific content to the needs of the students by setting tasks based on degrees of difficulty, correlated with the marking grid, with the aim of allowing students to prepare for the exam according to their own ability and aspirations.
- Continuous updating and improvement of course, seminar and laboratory didactic material in accordance with the latest developments in the field, by designing new topics.

The proposed objectives have the general purpose of applying, valorizing and transferring the accumulated knowledge, as well as to analyze and interpret some situations and processes associated with the field.

Research objectives are as follow:

- Acquiring skills to use new methods and equipment specific to the disciplines related to the job.
- Capitalizing on the results obtained from research activities through the publication of scientific works.
- Participation in national and international conferences to promote the results obtained from the research activity.
- Increasing the scientific reputation of the discipline, the faculty, and the university, respectively.