

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



**DEVICES AND LABORATORY TECHNIQUES USED
IN EXPERIMENTAL AND ENVIRONMENTAL
MEDICINE**

ABSTRACT

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The habilitation thesis with the title of **Devices and laboratory techniques used in experimental and environmental medicine** represents a synthesis of the scientific, academic and professional activity of the undersigned after obtaining his doctoral degrees in Medical Sciences, in 2006, and in Chemical Engineering, in 2010, respectively.

On account of my advanced academic training in these particular areas of science, I adopted an interdisciplinary approach for investigating the scientific subjects that interest me, with the purpose of increasing the complexity and improving the quality of the experimental models considered.

As per current academic requirements, the habilitation thesis is composed of four parts, as follows: the first part is dedicated to the main scientific achievements, the second part to the academic accomplishments, the third part contains the main professional achievements, while the last part introduces a plan of scientific, academic and professional development.

According to information published online on the Clarivate Web of Science website, the scientific activity of the undersigned, up until today, has generated a total of 327 citations, of which 308 citations excluding self-citations, accounting for a Hirsch index of 9.

I published a number of 11 articles in ISI ranked journals, as the main author, reaching a cumulative impact factor in the year of publication 13,42; and 23 articles as co-author.

I have collaborated with several prestigious universities, such as the Polytechnic University of Timișoara, where I am currently part of the tenured teaching staff, Banat's University of Agricultural Sciences and Veterinary Medicine King Mihai I of Romania from Timișoara and the University of Szeged, with university hospitals, including the Department of Oncohematology and Bone Marrow Transplantation from Louis Țurcanu Emergency Hospital for Children in Timișoara, the Anesthesia and Intensive Care Unit of the Pius Brînzeu County Emergency Clinical Hospital Timișoara, the Anesthesia and Intensive Care Unit of the Fundeni Institute of Cardiovascular Diseases, the OncoGen Research Center for Gene and Cellular Therapies in Cancer from Timișoara, on various research projects and on the development of complex experimental models. These collaborations supported the development and delivery of doctoral theses, the publication of a significant number of scientific papers in ISI and BDI indexed journals, as well as the materialization of two invention patents.

The postdoctoral scientific activity of the undersigned has continued in a logical and consistent way the research undertaken during his doctoral studies, combining the two scientific fields and broadening the scope of his competences with the addition of the

advanced academic degree of Master in Biomedical Electronics, obtained from the Polytechnic University Timisoara in 2020.

The main research areas I explored during this period were the following: (I) The development, design and fabrication of new experimental devices with applicability in the field of experimental anesthesia, physiological cardiovascular investigations, as well as in regenerative and transplant medicine, adding to the devices previously built during my PhD in Medical Sciences and thus, greatly enhancing the scope of experimental models that can be utilized by our research group. Employing these devices, three doctoral theses have been developed and completed, and valuable scientific papers have been published. (II) Experimental studies regarding cardioprotection induced by inhalation anesthetics aimed at identifying new molecular targets with therapeutic applicability and developing recommendations that can be translated to the clinical practice, (III) Development, design and fabrication of an experimental Langendorff device for the *in vitro* decellularization of the rat heart equipped with a video system for tracking the kinetics of the decellularization process. This device is currently used for experimental investigations essential for the completion of two doctoral theses. (IV) Experimental *in vivo* and *in vitro* studies related to aspects of regenerative and environmental medicine. (V) Elaboration, design and fabrication of experimental devices for the treatment of complex waste waters with chemical and microbiological load originating from sanitary units and expired drugs. Thusly, I continued my studies on electrochemical methods for treating waste water resulting from the medical sector, started during my doctoral research in the field of chemical engineering. The aim of these research activities has been to identify new possibilities of neutralizing these harmful residues which constitute a serious problem for the environment and for the health of humans and animals.

From 2010 to 2012 I was the recipient of a postdoctoral scholarship from the Bucharest Institute of Biochemistry, supported by the Romanian Academy, part of the POSDRU project no. 1748/2008. The research subject investigated was the following: Studies regarding the differentiation of mesenchymal stem cells into adipocytes. During this time, I had the opportunity to acquire new skills pertaining to laboratory work, to acquire fundamental knowledge of cellular and molecular biology, and last but not least, to develop my communication and networking skills with other research groups.

I commenced my academic activity in 2004, as a teaching assistant, at the Victor Babeş University of Medicine and Pharmacy in Timișoara, Faculty of General Medicine Department of Physiology, advancing to the position of Associate professor, and since 2018

I am part of the tenured teaching staff as Lecturer at the Polytechnic University of Timișoara, Faculty of Industrial Chemistry and Environmental Engineering. My didactic activity has consisted of: supervision of laboratory work in several academic subjects, presenting academic lectures, publishing of three books as the main author and coordinating 11 BSc theses and dissertations. I participated to workshops and student symposia at both universities I was affiliated to. I was also actively involved in equipping several laboratories by constructing new experimental stands for didactic use both at the Faculty of General Medicine (UMVBT), and at the Faculty of Industrial Chemistry and Environmental Engineering (UPT).

I began my professional activity in 2000, as a trainee doctor at the Timișoara Municipal Emergency Clinical Hospital, then continued my work as an ICU resident doctor at the Pius Brînzeu County Emergency Clinical Hospital in Timișoara. Subsequently, I worked as an Anesthesiology specialist at the ICU of the Department of Oncohematology and Bone Marrow Transplant of the Louis Țurcanu Emergency Clinical Hospital for Children in Timișoara until 2014. Starting from 2003 as a volunteer, then from 2007 until present, as an associate researcher, I was part of the research group of the Regional Center for Transplant and Immunology, currently the OncoGen Center for Gene and Cell Therapies in Cancer. From 2016 until now, I also activated as a part-time scientific researcher in the field of chemical engineering, at SC Natural Ingredients R&D Făgăraș, a company specialized in the production of natural flavor compounds.

The manual skills acquired in the laboratory of experimental medicine during *in vivo* work on rats allowed me to successfully perform difficult vascular access procedures in pediatric patients, as well as small surgery procedures used in the ICU, such as the insertion of central venous catheters with implantable subcutaneous access port for the delivery of chemotherapy.

In the last part of the present habilitation thesis, I presented briefly the development areas that I wish to approach in the coming years. I intend to follow several directions simultaneously: development of teaching and academic abilities, advancement of university career, involvement in scientific research and, last but not least, personal development. I will focus on the fabrication of novel experimental devices, the development of cutting-edge experimental models at the frontier between the fields of medicine, chemistry and medical electronics, the coordination and continuous support of the laboratory of the activity of undergraduate and graduate students. Regarding the didactic activity, I intend to continuously improve my teaching and communication skills, to apply interactive teaching

methods suited to the needs of each generation of students, ensuring a solid connection between the content of the lectures and that of practical activities, with an emphasis on the requirements of future employers, so that undergraduate as well as graduate students will acquire a complete package of theoretical knowledge and practical skills that will be useful in their future career. Regarding the mentoring of future doctoral candidates, I intend to create a mutually supportive collaboration between the Doctoral Schools within the Victor Babeş University of Medicine and Pharmacy Timișoara and the Faculty of Industrial Chemistry and Environmental Engineering within the Polytechnic University of Timișoara and the OncoGen Center for Gene and Cellular Therapies for Cancer Timișoara, ensuring that the doctoral students have access to an exceptional research infrastructure.

The bibliography includes a number of 215 titles, representative for the fields presented, formulated in accordance with university standards.

The present habilitation thesis concludes with ten representative articles published in recognized scientific journals and two annexes that detail the two invention patents mentioned above.