



*UNIVERSITATEA DE MEDICINĂ ȘI FARMACIE
"CAROL DAVILA" BUCUREȘTI*



ȘCOALA DOCTORALĂ
MEDICINĂ DENTARĂ

HABILITATION THESYS

Multidisciplinary interfaces in dentistry
- abstract -

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The habilitation thesis represents a summary of the personal teaching and research activities of the last years, in the field of prosthodontics technology and dental materials (synthesis and characterization of biomaterials, the interaction between different types of biomaterials, the interaction between biomaterials and biological structures, methods of improving technologies for application of biomaterials in dentistry). The habilitation involves the presentation of the research carried out since the presentation of the doctoral thesis in December 2011 until now. The research started from ideas debated 20 years ago in the Discipline of Prosthetic Technology and Dental Materials together with the mentoring professors and collaborators.

This work was developed based on the results presented in chapters published in international books, presentations at international conferences and articles published in journals indexed in Clarivate Analytics as well as in international journals indexed in different databases, in the field of prosthetics technology and dental materials.

The habilitation thesis contains two sections. In the first section, the professional, scientific and academic achievements are presented, and in the second, the evolution and development plans for the professional career are described.

In the first part of the habilitation thesis, the professional, scientific and academic achievements are presented according to the thematic directions. Achievements are documented by references to publications, patents or other published results, each item being available for consultation. Of these, the most important works are included in the habilitation file. Personal achievements are presented in the context of the current state of scientific research in the thematic field of dental medicine specialty for research areas with national specificity, emphasizing the relevance and originality of personal contributions. In this regard, the invention patents, the course and experience in research projects, the activity of reviewer and member of editorial committees, specialized books, coordination of award-winning scientific works, awards and distinctions obtained, professional training and specialization internships completed as well as recognition and impact of activity.

The scientific activity and the main scientific results are presented in the first part of the habilitation thesis, structured in three subchapters. In the first two sub-chapters, results are presented regarding the study of interfaces at the level of implants and prostheses on implants, with possibilities to modify the surface of materials and biomedical devices to obtain an improved in-vitro behavior. The presented researches were based on the characterization of dental implants and fixed prostheses, single or multiple. Perspectives related to the microstructure of the cross-sectional samples or the prosthetic surface (surface defects) were targeted. An additional aspect involved studying the possibilities of improving metal-ceramic compatibility, by analyzing the mechanisms and processes

involved in optimizing the compatibility of metals and ceramics. Regarding this aspect, it was aimed to combine the deposition of thin ceramic layers with a thermal treatment, to favor the atomic diffusion at the interface. Subchapter 3 of this part concerned the analysis of the possibilities of synthesis and processing of biomaterials (of the calcium phosphate type) derived from materials of natural origin. Since one of the most important aspects regarding the identification of the type of calcium phosphate obtained is the correct establishment of the chemical composition of the material, the first aspect pursued consisted in researching and establishing the optimal parameters for characterization by microanalysis (EDS), a complementary method to scanning electron microscopy (SEM). Subsequently, the main objective was pursued consisting in the identification of the key parameters necessary for the optimization of the process of synthesis and processing of calcium phosphates of a biogenic nature. Marine and terrestrial resources included in the study were marble, shells, as well as cattle and fish bones. These proposed precursor materials are convenient candidates for the preparation of bone substitutes that can simulate the inorganic (mineral) component of natural bone tissue. Furthermore, by carefully controlling the key parameters involved in the conversion of calcium carbonate and the biological isolation of apatite, the composition of the final ceramic products could be modulated to create biphasic, long-term performing calcium phosphates with biomedical applicability. During the research, obtaining biomaterials for bone substitution from fish bones was identified as a niche component, very little studied. In this direction, the work continues with the detailed presentation of the technological aspects of obtaining the materials and the results of the compositional, morphological, structural and surface characterizations of some products obtained by processing the bones of a certain fish species. The identification of optimal ways to achieve these goals has contributed to the substantial development of bone reconstruction materials.

In the second section of the thesis, the plan for the evolution and development of the scientific activity is presented, with detailed future research directions that are expected to improve the scientific impact. It is proposed to further modernize the dental school of U.M.F. "Carol Davila" Bucharest, through the appropriate endowment with top equipment that allows the high-performance training of the students of the Faculty of Dental Medicine, the development of projects from European funds (Horizon 2020, Erasmus +, POCU, etc.) to ensure the necessary resources to support the training performance of students and residents, as well as to ensure specialization internships abroad, the involvement of the team of the Prosthetics Technology discipline in the development of interdisciplinary research topics in the fields of dental prostheses and nanobiomaterials, ensuring participation in national and international conferences to validate the results obtained in the research, scientific and medical practice, ensuring the mobility of teaching staff in and out of other university clinics, in order to open collaborations for the professional benefit of the parties, approaching, by

scientific research, of eliminating error factors in the dental prostheses achievement and bringing the latest, interesting and appropriate results obtained in scientific research into the content of the courses.

To increase the performance in scientific research, are proposed new approaches in the technology of prostheses and biomedical devices in dental medicine, interdisciplinary approaches between the fields of medicine and biomechanics, bioinformatics, the amplification of fundamental and clinical scientific research activities in the field of dental robotics, and the development of the field of Prosthodontics Technology. The author is taking into consideration the continuation of fundamental and applied research in the field of biomaterials, the approach of nanobiomaterials for bone reconstruction, as bone addition materials, as well as vectoring and controlled release support of drugs used in dentistry, the approach of scientific research in the field of new materials, used in technology prosthodontics and multidisciplinary clinical approaches to increase the efficiency of the medical act.

An important objective for the development of academic activity is the participation to the internationalization of dental medicine education and complex scientific research activities, through the development of partnership relations between the "Carol Davila" University of Medicine and Pharmacy, School of Dental Medicine and similar dental schools from prestigious universities abroad, the establishment of partnerships between university dental clinics of to the "Carol Davila" University of Medicine and Pharmacy and similar clinics abroad, the participation, through academic mobility, as visiting professor of members of the Department of Prosthodontics Technology in universities abroad, attracting as "visiting professors" teaching staff with achievements and scientific prestige to support conferences, workshops and scientific seminars from partner universities, the realization through the doctoral school of some PhD thesys by doctoral professors involvement from other universities, from our country and abroad, in order to ensure interdisciplinary development, participation and partnership with universities from the country and abroad, in solving some scientific research topics from Romanian or European funding programs.