

ACADEMIA ROMÂNĂ

SCOSAAR

Anexa nr. 6

## SUMMARY OF THE HABILITATION THESIS

## TITLE: Insights in the molecular epidemiology of viral infections

Habilitation domain: Medicine

## Author: SULTANA MĂDĂLINA CAMELIA

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## **SUMMARY**

The habilitation thesis "Insights in the molecular epidemiology of viral infections" addresses the most relevant scientific contributions attained in the postdoctoral period (2006 - present), the manuscript being divided into three sections.

The first section presents the stages completed during the scientific professional career (section I.A.1), but also a series of aspects that reflect the dynamics of the research activities assumed especially after the award of the PhD title in 2006 (section I.A.2).

I am the coordinator of the "Emerging Viral Infections" Department from "St. S. Nicolau" Institute of Virology (Decision no. 51/01.12.2016), and Associate Professor of Virology at "Carol Davila" University of Medicine and Pharmacy, Bucharest, Romania.

My research highlights the importance of understanding the viral diseases' molecular epidemiology and its diagnostic impact on the prevention and treatment outcome (section I.A.2). This work integrates studies on molecular epidemiology of hepatitis C virus (HCV) and investigation of new prognostic biomarkers in the evolution of HCV infection, together with results of genotyping studies in HBV infection, and studies on co-infections of parenterally transmitted viruses: HIV, HBV, and HCV co-infections (section I.A.2.1, subchapters I.A.2.1.1- I.A.2.1.4). In the last years, associated to the epidemiological context provided by SARS-CoV-2 pandemic, my scientific concerns were moreover focused on the study of emerging viral infections, COVID-19 being the most certain example of emerging pathology (section I.A.2, subchapter I.A.2.2).

World Health Organizations sustainable development goals for 2030 aim to end the epidemic of AIDS, combat hepatitis and other communicable and sexually transmitted diseases by 2030; in this context our results indicate the need for implementing targeted procedures, tailored to the local epidemiology that can lead to micro-elimination of HIV and viral hepatitis infections in Romania, and ultimately to the macro-elimination of these impeding infections.

Our phylogenetic analysis showed that HCV subtype 1b, the most common in Romanian population, show similarities with the strains found worldwide, without specific geographic clustering, while the genetic distances between the HCV subtype 1a sequences were very homogeneous and small, indicating the recent introduction of new HCV genotypes and subtypes in Romania. This implies the need for a continuous alert, suggesting shifts in the transmission pathways, with the possible expansion of a previously minor subtype or with the emergence of recombinants in people with multiple infections. The recognition of the potential presence of multiple or/and new risk factors adds valuable information to the overall European

epidemiological picture, and may have important implications for the improved design of treatment and prevention campaigns.

Other scientific concerns have been focused moreover on the study of emerging viral infections, and in this context, we conducted studies on the kinetics and persistence of immune responses in vaccinated people with or without previous SARS-CoV-2 infection, and the results indicated that the majority of HIV-infected patients retain their post-vaccination and post-infection SARS-CoV-2 humoral and cellular immunity, still, with a lower immunogenicity demonstrated in severely immunocompromised people, regardless of their HIV viral load.

The last part of the scientific achievements section focused on new compounds with broad-spectrum antiviral activity and viral oncogenesis studies. Our studies reflected that different synthetic peptides derived from Lactoferrin have the advantage of a low molecular weight and offer the possibility of in vitro molecular simulation studies, that can improve their antiviral activity, representing promising candidates for prophylaxis and treatment of a broad-spectrum viral infections.

In section I.B. the academic achievements are described, including the academic career and the main teaching responsibilities, the modalities of improving of the professional skills, project management capacity and the impact of my scientific results.

In Section II the future career development directions, beginning with the strategies for the development of the academic career and the perspectives related to the research activity are defined. The habilitation thesis outlines a clear vision for the future, emphasizing the commitment to academic and professional growth, particularly in areas critical to virological diagnosis.

An important part of the academic development (section II.1.) is enhancing the educational initiatives to train the next generation, firstly by motivating the students regarding their future orientation in choosing the medical specialty; consequently, their involvement in the research activity is an objective that I constantly follow. There must be also a strong emphasis on high standard molecular diagnosis, aiming to provide students and trainees with comprehensive knowledge and practical skills to challenge viral diseases effectively, and ensure that their education remains aligned with the rapidly evolving landscape of European and worldwide health challenges.

The proposal for the development of my scientific and research career (section II.2.) is based on the results obtained during almost 25 years of scientific research carried out in the Virology Institute. A central focus is a specific emphasis on diseases with high prevalence in the epidemiological context in Romania: chronic viral hepatitis, diseases of great importance and severity at global level: HIV infection, and diseases at risk of emergence/re-emergence in Europe.

Future plans include the development of innovative research projects that integrate multidisciplinary

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approaches to address the continuous evaluation of viral subtypes and variants of hepatitis viruses and HIV circulating in Romania, and their molecular characterization: substitutions, deletions, recombination, delayed ORF, in order to detect strains with increased pathogenic risk, and possible severe evolution in medical practice.

The last section of the habilitation thesis (section III) comprises the bibliographic references associated with the presented results and achievements.

In conclusion, this thesis integrates research and professional experience to address some of the most important challenges in viral molecular diagnosis, while the ultimate goal is to improve the molecular diagnosis of viral infections at national level, adding sensitive, specific and appropriate systems and highly trained personnel - better equipped to deal with the complexities of the recent challenges in Virology.

Date,

March 10, 2025

Signature,

Sultana Mădălina Camelia