"CAROL DAVILA" UNIVERSITY OF MEDICINE AND PHARMACY BUCHAREST

DOCTORAL SCHOOL OF MEDICINE

ADVANCEMENTS IN INFECTION CONTROL AND ANTIMICROBIAL RESISTANCE IN PUBLIC HEALTH

SUMMARY

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In the context of actual challenges faced by healthcare systems, the development and implementation of effective public health policies and measures are essential for improving strategies to prevent and to treat infectious diseases. This habilitation thesis addresses several priority infectious pathologies for public health, including sexually transmitted infections (STIs), respiratory viral infections, viral hepatitis, and tuberculosis. The research emphasizes the importance of understanding these diseases' epidemiology and societal impacts to improve prevention and treatment efforts.

The work integrates bio behavioral surveillance of HIV and other STIs, supporting public health interventions across Europe. A significant contribution of the thesis is also the detailed exploration of herpes simplex virus type 1 and type 2 (HSV-1 and HSV-2) prevalence in Romania, which highlights notable differences in exposure between genders. These findings have not only enhanced the understanding of HSV epidemiology but have also contributed to the development of European guidelines for STI management.

Vaccination plays a core role in controlling epidemics and safeguarding population health. Research presented in this thesis investigates vaccination trends and efficacy, including an analysis of varicella in Romania from 2004 to 2013. The findings reveal how vaccination influenced epidemiological and clinical trends in this disease, underscoring the critical role of immunization programs in reducing the burden of infectious diseases. Additionally, the work examines methods of vaccine procurement across Europe, exploring their impact on public health outcomes.

The thesis also analyzes the epidemiology of measles during the 2016 epidemic in Romania, focusing on the clinical characteristics of hospitalized cases. These studies provide actionable insights into improving vaccine accessibility and uptake, particularly in vulnerable populations. Research on healthcare workers and elderly populations, reveals critical insights into the immune responses elicited by mRNA vaccines, including the necessity of booster doses to sustain protection against variants like Omicron. Moreover, the thesis identifies disparities in vaccine access and uptake, advocating for policies that address these inequalities and promote equitable public health outcomes.

Antimicrobial resistance (AMR) represents a significant global public health threat, necessitating proactive approaches to monitoring and managing resistant bacterial strains. This thesis offers an integrated analysis of multiple factors driving this phenomenon, emphasizing the urgent need for effective, sustainable population-level solutions. The work examines antimicrobial resistance through the lens of risks associated with pathogens such as *Streptococcus pneumoniae* and the emergence of resistant strains like *Clostridium difficile* and carbapenemase-producing *Enterobacterales*. The research is emphasizing the complexity of the challenge of AMR and the need for interdisciplinary solutions, as well as underscores the necessity of comprehensive monitoring and control strategies to address resistance trends in light of recent epidemiological developments.

The thesis provides a multidisciplinary perspective on tackling these pressing health challenges, combining clinical research, public health policy, and academic contributions. One notable area of focus is the integration of STI management guidelines into broader public health strategies. The development of European guidelines for STI management and participation in international studies like Sialon II, which monitored HIV and STI prevalence among MSM in Europe, are highlighted as achievements.

The habilitation thesis outlines a clear vision for the future, emphasizing a commitment to academic and professional growth, particularly in areas critical to public health. A central focus is the continued expansion of research into the microbiology and control of infectious diseases, with a specific emphasis on antimicrobial resistance and vaccination strategies. Future plans include the development of innovative research projects that integrate multidisciplinary approaches to address emerging public health challenges. This involves fostering collaborations with international research networks, professional and public health organizations, governmental bodies to translate scientific findings into effective public health policies and interventions.

An integral part of academic development is enhancing educational initiatives to prepare the next generation of healthcare professionals. There is a strong emphasis on curriculum development, aiming to provide students and trainees with comprehensive knowledge and practical skills to tackle infectious diseases and public health issues effectively. Plans include introducing new modules that focus on antimicrobial resistance, vaccinology, and health policy,

ensuring that education remains aligned with the rapidly evolving landscape of global health challenges.

In research, future directions include advancing the understanding of vaccine efficacy and implementation of immunization programs. This involves not only evaluating the impact of existing vaccination programs but also exploring delivery models to increase immunization rates, particularly in underserved and vulnerable populations. A priority will be placed on addressing disparities in vaccine access and overcoming barriers to immunization, such as misinformation and logistical challenges. Research efforts will also expand into the field of personalized vaccination, studying how individual variability in immune responses can be harnessed to optimize vaccine schedules and formulations.

Another key area of focus is the continued exploration of strategies to combat antimicrobial resistance. Plans include establishing monitoring systems to track resistance patterns and collaborating with international partners to develop comprehensive, evidence-based strategies for managing and mitigating the spread of resistant pathogens. These efforts aim to strengthen health systems' capacities to respond to resistance threats.

Finally, plans for academic growth include fostering a culture of collaboration and mentorship within the academic community. This involves supporting junior researchers and developing interdisciplinary partnerships to drive innovation in public health research. By creating opportunities for knowledge exchange and capacity building, the goal is to ensure that academic contributions have a positive and lasting impact on public health practice and policy. These plans reflect a long-term vision for continued engagement in research, education, public health and policy development, with the ultimate aim of improving population health outcomes.

In conclusion, this thesis integrates research and professional experience to address some of the most pressing challenges in public health. It reflects a commitment to advancing infection prevention and control, promoting vaccination, and combating antimicrobial resistance. The ultimate goal is to improve health outcomes for populations at both national and global levels, supporting systems that are better equipped to navigate the complexities of modern public health challenges.