

## A Special Journal Issue: Advancing Pharmaceutical Sciences: From Drug Discovery to Patient Outcomes

The Special Issue *Advancing Pharmaceutical Sciences: From Drug Discovery to Patient Outcomes* brings together ten original research articles that collectively reflect the breadth and depth of contemporary pharmaceutical research and practice.

The pharmaceutical sciences are undergoing rapid transformation, driven by technological advances, growing interdisciplinarity, and an increasing emphasis on translating scientific discovery into tangible patient benefit. The main objective of this Special Issue is to highlight how progress across the entire pharmaceutical development continuum encompassing molecular-level investigations, analytical innovation, clinical practice and patient-centred care contributes to improved therapeutic outcomes and quality of life. The contributions exemplify the synergy between fundamental research, applied pharmaceutical sciences, and healthcare implementation.

The research presented in this issue is structured around four key pillars that define the current challenges and advancements in the pharmaceutical landscape.

Addressing antimicrobial resistance requires a multifaceted approach, from monitoring water systems to improving patient behaviour. The study by Batarilo and colleagues provides an in-depth analysis of *Ralstonia pickettii* isolates from pharmaceutical water systems, demonstrating the organism's motility, biofilm-forming capacity, endotoxin production, and multidrug resistance. These findings underscore the importance of rigorous monitoring of pharmaceutical water systems to mitigate transmission risk and forestall the development of antimicrobial resistance in environment. Complementing this perspective, Stupin Polančec and colleagues investigate the antibacterial and antibiofilm activities of naturally occurring naphthoquinones against *Escherichia coli*, offering mechanistic insights into reactive oxygen species, membrane permeability, and inhibition of motility and biofilm formation, and highlighting the therapeutic potential of those natural compounds.

The impact of clinical practices on infectious disease outcomes is further explored in the context of the COVID-19 pandemic. El Hassouni and colleagues reveal a strong association between COVID-19 treatment strategies, specifically extensive antibiotic use, and the increased incidence of *Clostridioides difficile* infection. Their finding underscores the need for rational pharmacotherapy and targeted prevention strategies, especially in elderly and high-risk populations.

Two studies in this issue underscore the expanding role of the clinical pharmacist in direct patient care and medication management. Vilić and collaborators demonstrate that structured pharmacist-led counselling at hospital discharge significantly improves adherence to oral antibiotic therapy, providing evidence for the integration of clinical pharmacists into discharge processes as a means of combating antimicrobial resistance. In the context of chronic disease management, Momčilović and colleagues further evaluate the optimization of adherence assessments in heart failure patients. The comparison of MARS-5 and MARS-10 adherence assessment tools in hospitalised heart failure patients highlights practical, time-efficient approaches for identifying nonadherence and preventing serious clinical complications, further underscoring the pivotal role of pharmacists in optimising pharmacotherapy and patient outcomes.

Natural compounds and plant-based therapies remain a cornerstone of drug discovery, particularly in the development of innovative treatments for dermal application and localized therapy.

Karković Marković and colleagues elucidate the antioxidant mechanism of methyl caffeate, a naturally occurring methyl ester of caffeic acid, using combined experimental and computational approaches, providing compelling evidence for a proton-coupled electron transfer mechanism and highlighting the compound's potential relevance in pharmaceutical and nutraceutical formulations.

Natural products and innovative formulations are further represented by the randomized controlled trial conducted by Šušak Crnčević and colleagues, which demonstrates that the addition of *Calendula officinalis* supercritical CO<sub>2</sub> extract to an emollient cream enhances skin hydration and accelerates barrier recovery in contact dermatitis. This study illustrates the growing relevance of evidence-based dermatocosmetic and non-pharmacological interventions within pharmaceutical sciences.

Modern pharmaceutical science bridges the gap between identifying patients at risk and developing molecules that can offer specific organ protection. Bokulić and colleagues explores the integration of clinical risk factors with laboratory biomarkers to improve the management of preeclampsia, highlighting the value of integrating biomarker-based screening into routine obstetric practice. The study by Turčić and colleagues on peptide chirality provides novel insights into opioid receptor modulation, demonstrating that D-Met-enkephalin retains hepatoprotective activity in acetaminophen-induced liver injury, thereby opening new avenues for peptide-based drug design.

Finally, modern pharmaceutical analysis and technology are the cornerstones of developing innovative pharmaceutical products, where advanced analytical methods ensure both safety and efficacy of new products. Within this framework, the integration of green analytical chemistry has become essential, aligning cutting-edge pharmaceutical development with the global demand for sustainable and environmentally responsible laboratory practices. Thus, the work by Amidžić Klarić and colleagues addresses sustainable pharmaceutical analysis through the development and validation of a green HPLC-DAD method for prednisolone derivatives, demonstrating that analytical reliability and environmental responsibility can be successfully aligned.

Together, the contributions in this Special Issue reflect the multidimensional nature of modern pharmaceutical sciences. By integrating advances in drug discovery, analytical methods, formulation development, clinical pharmacology, toxicology, and pharmacy practice, this collection illustrates how interdisciplinary research can effectively bridge the gap between laboratory discoveries and improved patient outcomes. We hope that this Special Issue will stimulate further research, collaboration, and innovation across the pharmaceutical sciences and contribute to the continued advancement of patient-centred healthcare.

Finally, we would like to thank to the authors who published their research findings in this issue, the reviewers, and the Editor-in-Chief and Technical Editor, for their contribution in the preparation of this issue.

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