Emerging trends in polymeric drug delivery systems and fabrication techniques

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Abstract

Polymeric drug delivery systems offer significant advantages regarding controlled release, enhanced drug stability, improved bioavailability, and targeted therapy. This presentation will address current polymer-based drug delivery systems and the primary manufacturing techniques employed in their development. Polymeric nanoparticles, nanofibers, three-dimensional scaffolds, and microneedle systems will be evaluated in terms of the natural and synthetic biodegradable polymers used and their various routes of administration. Innovative manufacturing approaches—such as electrospinning, electrospraying, scaffold fabrication, and microneedle technologies—will be discussed using selected research examples related to preterm birth, diabetic wound healing, diabetes, bone tissue engineering, and Alzheimer's disease. In addition to in vitro and in vivo findings, the process of translating these developed systems from the laboratory to the final product will be addressed. In this context, aspects such as scalable manufacturing, intellectual property, patenting, commercialization, and entrepreneurship will be examined, highlighting the importance of multidisciplinary collaboration in translating innovative drug delivery technologies into real-world applications.

About the presenter

Assoc. Prof. Muhammet Emin Cam graduated from the Faculty of Pharmacy at Marmara University in 2012 and completed his PhD in Pharmacology at the same university in 2017. Following his PhD, he joined the Department of Pharmacology, where he had completed his doctoral studies, as a faculty member. From January 2024 to September 2026, Dr Cam continued his academic and administrative career at Istanbul Kent University. During this period, he led the establishment of the Faculty of Pharmacy; the Food Supplement, Cosmetics, and Vertical Farming Production Facilities; and the Nanotechnology, Cell Culture, Synthesis, and Microbiology R&D Centers. At Istanbul Kent University, he served as Vice Dean of the Faculty of Pharmacy, Advisor to the Rector, and Chairman of the Executive Board. His research focuses on Alzheimer's disease, diabetes, medicinal plants, drug delivery systems and their manufacturing technologies, 3D printing, and biomaterials. Dr Cam conducted his postdoctoral research at University College London (UCL) between 2018 and 2019. Since June 2018, he has served as a Visiting Professor in the Department of Mechanical Engineering at UCL, and since October

2022, as a Guest Lecturer in Biomedical Engineering at the University of Aveiro, where he conducts research and delivers postgraduate courses. In 2023, he has also continued his academic activities as a Guest Lecturer and Researcher within the Division of Surgery & Interventional Science, Department of Orthopaedics and Musculoskeletal Science, at UCL Previously, he served as Vice Dean of the Faculty of Pharmacy at Marmara University from 2020 to 2022. Dr Cam has authored more than 80 scientific publications, the majority of which have been published in SCI-indexed journals, and is an inventor on numerous national and international patents. He has delivered keynote lectures at numerous international congresses and has received multiple international publication awards, with several of his studies featured on journal covers. He actively participates in numerous projects funded by the Health Institutes of Türkiye (TÜSEB), the Scientific and Technological Research Council of Türkiye (TÜBİTAK), and international funding bodies. He currently serves as Chairman of the Scientific Board of the Technology, Pharmaceutical, and Domestic Industry Association (TİYSAT), as well as Chairman and Advisor of the Turkish Red Crescent Food & Beverage Scientific Board. As the founder of MecNano Technologies, Dr. Cam develops advanced drug delivery systems and the technologies and equipment required for their production, while also providing formulation development and scientific consultancy services to numerous companies. His scientific publications have received more than 2,000 citations to date, with an h-index of 26 and an i10-index of 43. In September 2025, he was included in the prestigious *World's Top 2% Scientists* list, compiled annually through the collaboration between Stanford University and Elsevier. At the ISIF'25 International Invention Fair, Dr Cam was awarded a Silver Medal for his patent entitled *Functional Beverages with Enhanced Bioavailability and Their Production Methods.* Dr Cam has supervised six PhD and two MSc students to successful completion and currently supervises three PhD candidates.