

Special Issue

Recent Advances in Cryogenic Drug Delivery

Message from the Guest Editor

Cryogenic drug delivery harnesses ultra-low temperatures and controlled freezing to enhance the stability, targeting, and release profiles of therapeutic agents, with particular benefits for biologics, vaccines, cell therapies, and nanomedicines. By integrating insights from cryobiology, materials science, and pharmaceutical technology, this field overcomes longstanding barriers related to degradation, immunogenicity, and poor tissue penetration. Recent advances in cryogenic drug delivery—such as cryopreservation protocols, ice-templated scaffolds for sustained release, picoliter ice particles for needle-free transdermal delivery, and cryo-shocked vesicles—are expanding its applications in oncology, ophthalmology, dermatology, and regenerative medicine while raising new questions about ice–drug interactions, recrystallization control, and translation to clinical settings. This Special Issue welcomes high-quality original research and comprehensive reviews that explore the fundamental principles, novel formulations, and therapeutic potential of cryogenic drug delivery systems.

Guest Editor

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