

CERTIFICATE NO : **ICASEMH /2023/C0223257****Biodegradable Polymer-Based Drug Delivery Systems: A Sustainable Approach for Controlled and Targeted Drug Release****Sudhir Panwar**

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ABSTRACT

Biodegradable polymer-based drug delivery systems have gained significant attention in modern pharmaceutical research due to their ability to provide controlled and targeted drug release while maintaining environmental and biological safety. These systems utilize biodegradable polymers such as polylactic acid (PLA), polyglycolic acid (PGA), polycaprolactone (PCL), and poly (lactic-co-glycolic acid) (PLGA), which gradually degrade into non-toxic by-products within the body. This property eliminates the need for surgical removal of the delivery device and enhances patient compliance. Biodegradable polymer carriers can be formulated into various structures such as nanoparticles, microspheres, implants, and hydrogels that enable sustained drug release over an extended period. Such systems help maintain optimal drug concentrations in the body, reduce dosing frequency, and minimize adverse side effects. Furthermore, advances in polymer chemistry and nanotechnology have enabled the development of targeted drug delivery systems that can deliver therapeutic agents directly to specific tissues or diseased cells, improving treatment efficacy. These delivery systems are particularly beneficial in the treatment of chronic diseases such as cancer, diabetes, and cardiovascular disorders. In addition to therapeutic benefits, biodegradable polymer-based systems support sustainability by reducing long-term material accumulation in the body and the environment. Therefore, these innovative drug delivery platforms represent a promising and sustainable approach for improving modern pharmacotherapy.