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**Advanced Drug Delivery Systems Based on Biodegradable Polymers:
Innovations and Therapeutic Applications**

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ABSTRACT

Advanced drug delivery systems based on biodegradable polymers have emerged as a promising approach in modern pharmaceutical science to improve the effectiveness, safety, and targeted delivery of therapeutic agents. Biodegradable polymers such as polylactic acid (PLA), polyglycolic acid (PGA), and their copolymer poly (lactic-co-glycolic acid) (PLGA) are widely used because they can naturally degrade into non-toxic by-products within the body. These materials allow drugs to be released in a controlled and sustained manner, reducing the need for frequent dosing and minimizing side effects. Recent innovations in this field include the development of nanoparticles, microspheres, hydrogels, and implantable drug delivery devices that enhance drug stability and bioavailability. Such systems are particularly useful in the treatment of chronic diseases such as cancer, diabetes, and cardiovascular disorders, where precise and long-term drug administration is essential. In addition, biodegradable polymer-based carriers can be engineered to deliver drugs specifically to targeted tissues or cells, thereby improving therapeutic outcomes and reducing systemic toxicity. Advances in nanotechnology and polymer chemistry have further expanded the possibilities for designing smart drug delivery systems that respond to environmental stimuli such as pH, temperature, or enzymes.