

Applications And Emerging Trends In Pharmaceutical Nanotechnology

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6 PATENT STRATEGIES AND INTELLECTUAL PROPERTY MANAGEMENT IN NANOTECHNOLOGY-BASED DRUG DELIVERY

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6.1 ABSTRACT

The development of nanotechnology-based drug delivery systems has revolutionized modern drug research by providing targeted drug delivery, improving drug efficacy, controlling drug release, and minimizing systemic drug toxicity effects. A wide range of nanocarriers, such as liposomes, polymeric nanoparticles, dendrimers, solid lipid nanoparticles, nanocrystals, and lipid-based nanocarriers, have been developed in recent years owing to the rapid progress in nanomedicine. The protection of intellectual property (IP) has become an integral component in the protection of innovation, attracting investment, and successful commercialization of these technologies as they move from the laboratory to commercial products. Strategies to protect new formulations, manufacturing processes, surface modifications, and therapeutic uses are key factors in successful patent protection in the face of changing regulatory and legal conditions. This chapter provides a detailed account of IP management and patent strategies in nanotechnology-based drug delivery. It provides an overview of the basics of IP rights, such as patents, copyrights, trademarks, and trade secrets, with a focus on the application of patent protection to innovations in nano pharmaceuticals. The chapter discusses the conditions for patentability, the analysis of prior art, drafting patents, patent filing process, and international patent protection mechanisms. It also explores issues of patenting nanomedicines, including overlapping technologies, regulation, freedom to operate, and issues of lifecycle management. Recent case studies and new trends in AI-driven patent analytics, global patent landscapes, and commercialization strategies are also emphasized. This chapter is designed to offer practical insights to researchers, academics, industry professionals, and policymakers in the field of protecting and commercializing nanotechnology-based drug delivery systems into viable pharmaceutical products by combining scientific innovation with IP management.

KEYWORDS: Pharmaceutical Nanotechnology, Drug Delivery Systems, Intellectual Property Rights, Patent Strategy, Nano Pharmaceutical Commercialization

6.2 INTRODUCTION

In the pharmaceutical sciences, nanotechnology has transformed the way drugs are administered by creating improved drug delivery systems that are not hindered by traditional dosage forms. Traditional drug delivery methods include difficulties with aqueous solubility, low bioavailability, non-specific distribution, unstable drug degradation, and undesirable systemic side effects. The use of nanotechnology has offered solutions to these problems by designing nanoscale carriers that can increase the stability of drugs, improve therapeutic efficacy, allow for controlled and sustained release, and allow for targeted delivery to specific tissues or cells. Liposomes, polymeric nanoparticles, dendrimers, solid lipid nanoparticles, nanostructured lipid carriers, nanocrystals, and