



Emerging Trends in Biopharmaceuticals: From Bench to Bedside

Caris Sima*

Department of Pharmaceutics, University of Melbourne, Australia

INTRODUCTION

In the realm of pharmaceuticals, innovation continually seeks to enhance the efficacy and convenience of drug delivery systems. Enteric-coated gelatin capsules stand as a testament to such advancements, revolutionizing the landscape of medication administration. These capsules, encapsulating active pharmaceutical ingredients, are designed to withstand the harsh acidic environment of the stomach, thereby ensuring targeted release and absorption in the intestines. This article delves into the intricacies of enteric-coated gelatin capsules, exploring their benefits, applications, and the science behind their functionality. Enteric-coated gelatin capsules serve a crucial purpose in pharmaceutical formulation by providing a protective barrier for sensitive APIs. Unlike traditional capsules, enteric-coated variants are designed to bypass dissolution in the stomach, where acidic conditions may degrade certain drugs or cause irritation to the gastrointestinal tract.

DESCRIPTION

The key component of these capsules is the enteric coating, a polymer layer that remains intact in acidic environments but dissolves rapidly in the alkaline conditions of the small intestine. This mechanism facilitates targeted drug release at the desired site of absorption, optimizing therapeutic outcomes and minimizing adverse effects. The efficacy of enteric-coated gelatin capsules hinges on the selection of appropriate polymers and the precision of coating application. These polymers exhibit pH-dependent solubility, remaining insoluble in acidic environments while rapidly dissolving in alkaline conditions. This pH-sensitive behavior is essential for ensuring that the enteric coating remains intact during gastric transit but dissolves promptly upon reaching the higher pH environment of the small intestine. The process of enteric coating involves multiple stages, including pre-coating preparation, coating application, and curing. During pre-coating, the gelatin capsules are typically subjected to a sealing process to prevent moisture

ingress, followed by the application of a sub-coating layer to enhance adhesion. Subsequently, the enteric coating solution, containing the selected polymer and plasticizer, is applied to the capsules using specialized equipment such as fluidized bed coaters or pan coaters. The coated capsules undergo curing to ensure uniformity and durability of the enteric coating, thereby guaranteeing optimal performance during gastrointestinal transit. Enteric-coated gelatin capsules offer a myriad of benefits that contribute to their widespread use in pharmaceuticals: The enteric coating provides protection against degradation by gastric acid, preserving the stability and potency of sensitive APIs. By bypassing the stomach, enteric-coated capsules mitigate the risk of gastric irritation and ulceration associated with certain medications. Targeted release in the intestines enhances drug absorption, leading to improved bioavailability and therapeutic efficacy. Enteric-coated capsules can be tailored to deliver drugs over an extended period, allowing for sustained release formulations that optimize dosing intervals and patient compliance. These capsules find applications across various therapeutic areas, including gastroenterology, rheumatology, and pulmonology.

CONCLUSION

Advances in polymer science and coating techniques hold the promise of overcoming existing challenges and unlocking new possibilities for enteric-coated gelatin capsules in pharmaceutical innovation. Enteric-coated gelatin capsules represent a remarkable advancement in drug delivery, offering a solution to the challenges posed by gastric degradation and gastrointestinal irritation. Through meticulous formulation and precise coating techniques, these capsules ensure targeted release and enhanced bioavailability of medications, thereby optimizing therapeutic outcomes and patient adherence. As pharmaceutical science continues to evolve, enteric-coated gelatin capsules stand at the forefront of innovation, poised to shape the future of medication delivery and improve the lives of patients worldwide.

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Corresponding author Caris Sima, Department of Pharmaceutics, University of Melbourne, Australia, E-mail: sima@car.com.au

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