Silymarin Complex with PLGA Polymers as a Potential Drug Formulation for Intestinal track Inflammatory Diseases

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Abstract

The nanoprecipitate method was utilized to form a drug polymer complex.

The organic phase was added to the aqueous phase and homogenized, followed by a period of stirring to remove the solvent.

Methods

Results

Drug: Silymarin, Polymer: PLGA 502H, 1:4
Solvents: Ethyl Acetate 7:3 Stabilizer: PVA

Formation of precipitate after centrifuge.

Future Outlook

In future experimentation, this project contains optimizing the drug release from the polymer using the pH dissolution test, drug loading, drug coatings at a range of different pH of the GI tract for release at specific times, and mice studies.

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References


Introduction

Crohn’s Disease and Ulcerative Colitis are cumulatively known as Inflammatory Bowel Disease (IBD), they are distinguished by inflammation in the gastrointestinal tract. A survey from 2017 stated that 57% of IBD patients were originally misdiagnosed, since the symptoms can suggest many things.1 Symptoms include2

As stated by Nature Reviews Gastroenterology & Hepatology, more than one million people in the United States and over two and a half million people in Europe are presumed to have IBD.3

Since the twentieth century, Ulcerative Colitis and Crohn’s Disease has significantly increased in the western world.

The prevalence in the Western world has now increased to 0.5% of the entire population.4

Recently, IBD has evolved into a global disease and its prevalence in every continent continues to grow exponentially.

Objectives

➢ To develop a stable PLGA drug polymer complex.
➢ To compare the PLGA complex to a S100 drug polymer complex.

Discussion

The FTIR data shown in the results section demonstrates that the drug polymer complex was successfully produced. In the figure, the FTIR results of the drug-Silymarin is shown in blue. The polymer used is PLGA resomer 502H which is shown as the gray line in the graph. PLGA is composed of carboxylic groups, ester groups and methyl groups which can all be seen in the data. The stabilizer which is Polyvinyl Alcohol (PVA) is represented in yellow. The structures of each compound are shown below.

The complex is shown in orange and demonstrates all the necessary peaks which correspond to the drug, polymer and stabilizer. From this we can conclude that the complex was successfully produced using the nanoprecipitation method.

Figure 1. (a) Effects of Crohn’s Disease & Ulcerative Colitis on GI Tract (b) Scope view of IBD

Crohn’s Disease and Ulcerative Colitis

➢ Cramps, Abdominal Pain
➢ Blood in stool
➢ Diarrhea, Constipation, bloating
➢ Visceral Hypersensitivity
➢ Fever, fatigue
➢ Unintended weight loss
➢ Intestinal Inflammation

PLGA 502H Structure

Based on scientific literature, IBD is a chronic disease that does not have any treatments without considerable side effects. The purpose of the proposed drug polymer complex pH sensitive delivery system is to reduce inflammation of the GI tract in Ulcerative Colitis and Crohn’s Disease. The complex formulation has been shown using the nanoprecipitation method with specific drug, polymers and stabilizer.