The synthesis and characterization of surface active a chitosan derivative

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Abstract
Lauryl chitosan was synthesized by synthesizing two concentrations of substitution: 5% and 15%. In order to investigate the reactions of lower molecular weight chitosan, several fatty acid chlorides were mixed. portrayal of H1NMR and FT-IR were used to analyze the derivatives' chemical structure. Finally, Thermal analysis techniques such as differential calorimetry (DSC) and thermogravimetric analysis (TGA) were used to examine the physical properties of the prepared compounds. Micelle formation is difficult due to the length of lauroyl chitosan derivatives (12carbons). All Chitosan derivatives were found non-toxic on human epithelial colorectal cancer cell lines, and cytotoxicity testing was completed via an MTT assay to demonstrate the usability of the particles as a drug carrier.

1. Introduction

CS, which has a molecular formula of C4H6O6N3, can be defined as a linear polysaccharide composed of glucosamine (GlcN) and N-acetyl glucosamine (GlcNAc) linked through β-(1–4) bonds [7]. partial Chitin alkaline deacetylation [1] is adequate for preparation of traditionally produced CS. It is found and occurs in great abundance in nature as well. CS also offers good biocompatibility as well as various additional advantages that come from the fact that it is solely a cationic polymer. The average of acetylation degree and molecular weight can be used to change the macromolecular characteristics of Chitosan [4]. But because CS has a high molecular weight, it has low solubility at neutral pH concentration in aqueous solutions. Due to this, polymers' family is constrained when it comes to biomedical uses, as a result. In contrast, low molecular weight (LMW) Chitosans have the highest water solubility, even when the pH varies significantly [5]. Chitosan has poor solubility in p-toluene sulfonic acid and dimethyl sulfoxide. Chitosan's chemical modification is limited due to the low solubility of this poor soluble characteristic. It is necessary to carry out chemical reactions differently for each application to prevent issues with solubility, as shown in [6].

2. Material and Method

Experimental Method

N-Acylation of Chitosan

Prepare a chitosan solution by adding 5 grams of chitosan in 300 ml of 1% v/v acetic acid was stirred overnight to make certain entire solubility. In order to get the pH to neutral, 0.5 M NaOH is added to the solution. This neutralized CS solution was obtained by adding 0.233 grams of lauroyl chloride to the CS solution, allowing the reaction to complete for 48 hours at room temperature, and removing the precipitate that formed. Lauroyl chloride, a highly reactive chemical, was employed to make distinct substitution degrees with varying weight percentages. However, when a solution was made acidic by the addition of 0.1 M NaOH and aCS derivative, a white precipitate developed in acetone. In order to collect the precipitate, the centrifugation process was set to spin at 3000 rpm. Afterward, three washings in warm methanol had been carried out to dispose of the generated acid chloride. Once the baked goods had cooled, they were stored at room temperature before use. See Table 1 for the results.The degree of N-acylation was 5% and 15% in the case of Chitosan.

Table 1: Chemicals and laboratory tools used in this work

Material	Source	Patch number
LMW chitosan Deacetylation (75-85%) MW=35Kda.	Sigma-Aldrich,US	MKBH1108V
Absolute Ethanol	VWR international,US	12G260506
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Acetone	Daejung, Korea	A0033MG5
Dichloromethane DCM	AZ chem, US	FG10081601
Dimethyl sulfoxide DMSO	Tedia company,US	907363
Sodium hydroxide NaOH	Gain Land Chemical Company, UK	1285
Glacial Acetic acid	Scharlau,Germany	29728/1468
Lauroyl chloride	Sigma-Aldrich,US	101414735
Potassium bromide KBr (FT-IR grade)	Sigma-Aldrich,US	SZBC3070V
Dialysis membrane MW cut off 1000 Da.	Spectra/Por,US	132105

Ensuring there were no insoluble contaminants was done with a purification operation known as yield dissolving. And finally, the solution (11) was frozen-dried.

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