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Review

Carboxymethylated Gums and Derivatization: Strategies and Significance in Drug Delivery and Tissue Engineering

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Abstract: Natural polysaccharides have been widely exploited in drug delivery and tissue engineering research. They exhibit excellent biocompatibility and fewer adverse effects; however, it is challenging to assess their bioactivities to that of manufactured synthetics because of their intrinsic physicochemical characteristics. Studies showed that the carboxymethylation of polysaccharides considerably increases the aqueous solubility and bioactivities of inherent polysaccharides and offers structural diversity, but it also has some limitations that can be resolved by derivatization or the grafting of carboxymethylated gums. The swelling ratio, flocculation capacity, viscosity, partition coefficient, metal absorption properties, and thermosensitivity of natural polysaccharides have been improved as a result of these changes. In order to create better and functionally enhanced polysaccharides, researchers have modified the structures and properties of carboxymethylated gums. This review summarizes the various ways of modifying carboxymethylated gums, explores the impact that molecular modifications have on their physicochemical characteristics and bioactivities, and sheds light on various applications for the derivatives of carboxymethylated polysaccharides.

Keywords: carboxymethylated gums; derivatization; drug delivery; tissue engineering

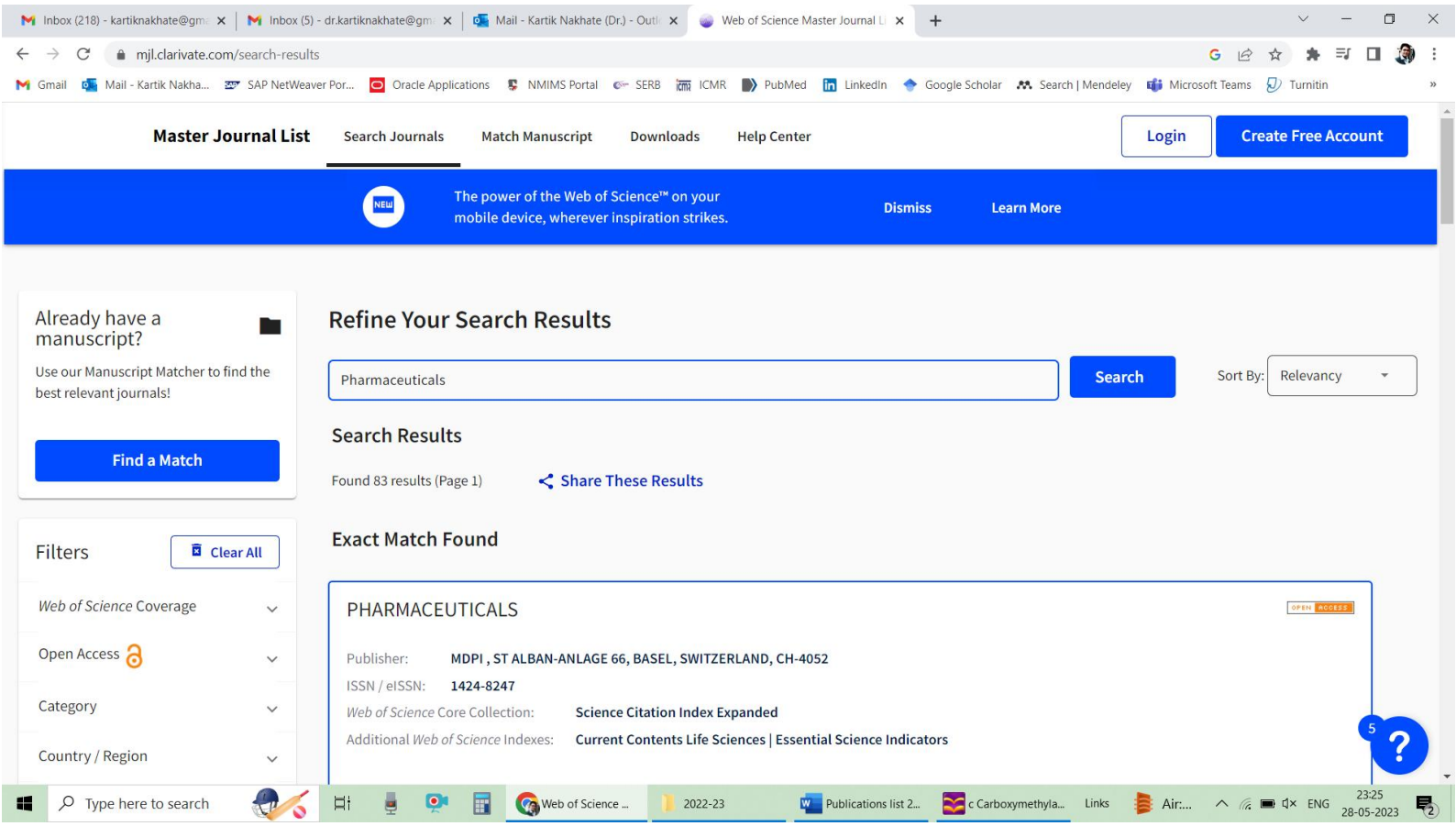
Citation: Baghel, M.; Sakure, K.; Giri, T.K.; Maiti, S.; Nakhate, K.T.; Ojha, S.; Sharma, C.; Agrawal, Y.; Goyal, S.; Badwaik, H. Carboxymethylated Gums and Derivatization: Strategies and Significance in Drug Delivery and Tissue Engineering. *Pharmaceuticals* **2023**, *16*, 776. https://doi.org/10.3390/ph16050776

Academic Editor: Serge Mordon

Received: 7 April 2023
Revised: 30 April 2023
Accepted: 4 May 2023
Published: 22 May 2023

1. Introduction

Polysaccharides, which are requisite polymers found in plants, animals, fungi, and bacteria, are one of the leading trends in modern medicine [1,2]. Due to their nontoxicity, affordability, ease of availability, biosafety, biodegradability, and widespread regulatory approval, natural polysaccharides outperform synthetic ones in many ways [3–5]. Natural polysaccharides exhibit adequate biological properties but are less suitable as drug carriers than synthetic polymers, as their structure and property correlation revealed certain drawbacks. Some polysaccharides do not possess bioactivity due to their particular structure and physicochemical properties [6]. Bioactive polysaccharides have higher molecular weight, making cell membrane penetration challenging [7,8]. The bioactivities of some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