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SYNTHESIS OF NANOCHITOSAN BOMBYX MORI AND ITS DERIVATIVES FOR MEDICINE

Milusheva R Yu and **Rashidova S Sh**
Institute of Polymer Chemistry and Physics Academy of Sciences of Uzbekistan, Uzbekistan

One of the leading positions in the list of industrially significant natural polymers, both in sense terms of availability and in the breadth of possible fields of application, for many years retains amino polysaccharide chitosan. Despite the fact that the unique characteristics of native chitosan ensure its relevance in various technological processes, chemical modification allows obtaining new products for solving specific problems. In this study, the synthesis of nano-chitosan Bombyx mori was carried out by fractional precipitation in the presence of a surface modifier. The optimal concentration of the solution of chitosan, pH, the ratio of the chitosan solution to stabilizer were determined experimentally. The resulting nano-chitosan had a low molecular weight of 70 kDa, an intrinsic viscosity of 1.5 dl/g, a nitrogen content of 8.22%, and a high solubility- 99.2%. Nano-chitosan Bombyx mori was tested for antibacterial activity on various strains of microorganisms: St.saprofiticus, Str.pyogens, Ent.faecalis, Esch. Coli LP, Esch. Coli LN, Prot.vulgaris, Klebsiella, Actinomyces. Investigations of the immunomodulatory properties of nanochitosan have been carried out and it has been revealed that the polymers have the ability to increase the immune response to erythrocytes of the mice, the antibody titer in the peripheral blood, stimulate cell proliferation in the central (thymus, bone marrow) and peripheral (spleen, lymph nodes) immunity organs, increase the number of erythrocytes and leukocytes in the blood of mice. When studying the effect of chitosan on the number of cells in the central organ of immunity-bone marrow, it was shown that chitosan, almost doubles the number of cells in the bone marrow. Initial chitosan has an obstacle to biomedical applications due to poor water solubility, a high positive charge in acidic media (pH <6.5), which induces, in contact with blood, problems such as hemolysis or thrombolysis. To overcome these problems, chitosan is chemically modified by grafting polyethylene glycol (PEG) to the chitosan chain. PEGylation of chitosan is mainly achieved by grafting PEG onto amino groups (N-modification), but this approach induces changes in the chain of chitosan and the loss of physicochemical properties. PEGylation to OH-groups (O-modification) is more interesting, since the O-modification does not affect the free amino groups in the chitosan chain. Grafting of PEG on chitosan Bombyx mori was carried out in a sequence of several steps: activation of PEG monomethyl ether using triphenyl phosphate to prevent product hydrolysis, protecting the amino groups of chitosan with phthalic anhydride, reaction of N-phthaloyl chitosan and activated polyethylene glycol, removal of N-phthaloyl groups by hydrazine monohydrate. The graft copolymers of (PEG-O-ChsBm) with different content of amino groups were synthesized and nanoparticles of copolymers were obtained by self-organization in dilute aqueous solutions. The supramolecular assemblies of PEG-O-ChsBm copolymers were characterized by light scattering, a combination of TEM, SEM, and cryo-TEM. Nanoparticles with an average diameter in the range of 140 nm-210 nm, depending on the content of amino groups was obtained. The toxicity of the nanoparticles was evaluated in HeLa and THP-1 cell lines. It was show the nontoxicity of both the chitosan Bombyx mori and its nanoparticles, besides it was found that the content of amino groups in the nanoparticles of the PEG-O-ChsBm copolymers acts as a trigger for the delivery of molecules, including most effective way.

Biography

Milusheva R Yu is a leading researcher in the Institute of Polymer Chemistry and Physics Academy of Sciences of Uzbekistan. She awarded PhD from Tashkent Polytechnic Institute. Her research interests lies in chemistry of macromolecular compounds; chemistry and technology of chitin and its derivatives, the creation of nanostructured polymers; physicochemical properties and structural morphology of nanopolysaccharide systems. In the field of applied research - the development of preparations based on polysaccharides and their use in the treatment of diseases of various etiologies.

rumilusheva@gmail.com