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N-Reacetylated Oligochitosan: pH Dependence of Self-Assembly Properties and Antibacterial Activity

Blagodatskikh I., Kulikov S., Vyshivannaya O., Bezrodnykh E., Tikhonov V.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2017 American Chemical Society. Oligochitosan (short chain chitosan) is more soluble in acidic aqueous media than a high molecular weight (MW) chitosan, but its antimicrobial activity decreases with increase in degree of acetylation (DA) and increase in pH above a critical pH threshold point. In the present study, oligochitos ans varying in MW were additionally N-acetylated and their self-assembly properties and antibacterial activity toward Staphylococcus aureus and Escherichia coli were investigated in a wide pH range as a function of MW and DA. Light scattering studies reveals that reacetyleted oligochitosan with M w ≤ 11 kDa is completely soluble in alkaline media (up to pH 12.5), if its DA is not less than 16%. Reacetylated chitosans with DA ~ 30% are solubile in the entire pH range up to 12.5, if their M w is not higher than 25 kDa, but they aggregate and precipitate from the solution at pH ≥ 8 when their M w is above 25 kDa. Considering the influence of DA and MW, the antibacterial activity of reacetylated oligochitosans is maximal in the short interval of DA 16-28% at pH 7.4. These results are promising for expanding practical application of oligochitosan in pharmaceutical, cosmetic, and food compositions.

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