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**Novel antimicrobial superporous cross-linked chitosan/pyromellitimide benzoyl thiourea hydrogels** 1  
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**Abstract** 8

In this work, chitosan (CS) was cross-linked with different amounts of pyromellitimide benzoyl thiourea moieties. The structure of the cross-linked CS was confirmed by elemental analyses, FTIR and <sup>1</sup>H- NMR spectroscopy. The cross-linking process proceeds via reacting of the amino groups of CS with the isothiocyanate groups of the N,N'-bis [4-(isothiocyanate carbonyl)phenyl] pyromellitimide cross-linker. The amount of the cross-linker was varied with respect to CS to produce four new pyromellitimide benzoyl thiourea cross-linked CS (PIBTU-CS) hydrogels designated as PIBTU-CS-1, PIBTU-CS-2, PIBTU-CS-3, and PIBTU-CS-4 of increasing cross-linking degree percent of 11, 22, 44 and 88%, respectively. The scanning electron microscopy observation indicates the extremely porous structure of the hydrogels. XRD results showed that the crystallinity of CS was decreased upon cross-linking. The four hydrogels exhibit a higher antibacterial activity on *Bacillus subtilis* and *Streptococcus pneumoniae* as Gram positive bacteria and against *Escherichia coli* as Gram negative bacteria and higher antifungal activity on *Aspergillus fumigatus*, *Syncephalastrum racemosum* and *Geotricum candidum* than that of the parent CS as shown from their higher inhibition zone diameters and their lower MIC values. The swell ability of the hydrogel as well as their antimicrobial activity increased with increasing cross-linking density. 9  
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**Keywords:** Chitosan hydrogels, Synthesis, Characterization, Swell ability, 26

Antimicrobial activity 27

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