Effect of Glycerol on Heat-Induced Gelation of Chitosan-β-Glycerophosphate

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Several years ago, a thermoreversible gel system was prepared by neutralizing chitosan solutions with a weak base, β-glycerophosphate [1]. It's one of the rare true chitosan physical hydrogels, while the exact mechanism is not yet known. We have investigated the effect of glycerol on the rheological properties of the chitosan-β-glycerophosphate system in order to assess the main interactions during the gelation process. The system in the presence of glycerol showed lower gelation temperature in non-isothermal tests. It indicated that glycerol affects the interactions by strengthening polymer-polymer hydrophobic effect, because hydrophobic interactions can indeed be favored by the presence of water-structuring molecules such as polyols [2]. We also found that the plateau modulus increased with the increase of glycerol content. The increased macromolecule compactness and self-association during the gelation contributes to more stable gel-network structure in comparison with the glycerol-free chitosan-β-glycerophosphate system. We concluded that the effect of glycerol on the gelation process was mainly related to an increase in polymer-polymer hydrophobic effect.

[1]. A. Chenite, et. al, Biomaterials 21 (2000).
[2]. K. Gekko and H. Ito, Journal of Biochemistry 107 (1987).