A smart carboxymethyl chitosan (CMCS) based hydrogel was obtained by cross-linking of imine dynamer with CMCS through second imine reaction. The imine dynamer was first synthesized by reaction of 1,3,5-benzenetrialdehyde and Jeffamine, as evidenced from NMR and FTIR analyses. The stability of dynamer was examined by NMR at various pH values. Data showed that the dynamer is stable at pH above 3. Miscellaneous molar ratios of CMCS to dynamer were applied to synthesize hydrogels in aqueous medium. The resulting hydrogels exhibited a three-dimensional porous network morphology, in good correlation with the crosslinking degree. The swelling properties were studied at various pH values (from pH3 to 9). All gels exhibited excellent pH-sensitive swelling properties. The swelling ratio reached 3200% and 2500% when immersed in pH 8 and pH 9 buffer for the hydrogel prepared with CMCS/dynamer ratio of 4/1. Rheological investigation demonstrated that the storage modulus (G’) and loss modulus (G”) depended on the molar ratio of CMCS to dynamer. The storage modulus increases while the CMCS/dynamer ratio raising from 1/1 to 4/1, reaching a maximum value of 1200 Pa at 4/1, whereas higher ratios (6/1 and 8/1) result in decrease of the modulus. These findings show that higher CMCS amount facilitates cross-linking between the aldehyde groups of dynamer and the amine groups of CMCS. Nevertheless, excessive amount of CMCS led to modulus decrease. Moreover, hydrogels showed self-healing properties within 30 mins, which is of great interest for potential biomedical applications. An immuno-modulating drug, thymopentin (TP5) was loaded in CMCS based hydrogels. The release of TP5 was evaluated under in vitro conditions.