OBTAINING ACTIVE NANO COMPOSITE FROM HYDROXYPROPYL METHYLCELLULOSE AND TITANIUM DIOXIDE (TiO$_2$) NANOPARTICLES

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In recent years, many studies have focused on investigating the active packaging, which can offer functions such as regulation of moisture or provision of antimicrobial activity. The inorganic bacteriostatic agents such as titanium dioxide (TiO$_2$) nanoparticles have attracted a great deal of attention over the past decade. TiO$_2$ is widely used as a self-disinfecting and self-cleaning material in many applications. The objective of this study was to explore the feasibility of producing antibacterial hydroxypropyl methylcellulose (HPMC) nanocomposites by incorporating TiO$_2$ nanoparticles. Antibacterial activity and morphological characteristic were investigated. The nanocomposites were obtained by addition of HPMC in the nanoparticle solution (recently prepared) under magnetic stirring. SEM analyses for nanocomposites containing TiO$_2$ nanoparticles revealed spherical nanoparticles homogeneously distributed in the HPMC films. To investigate the antibacterial activity of films, 1 cm diameter disks were cut from different nanocomposite films and placed on inoculated nutrient medium content Staphylococcus aureus (S. aureus) and Escherichia coli (E. coli). The disks were incubated at 37 °C for 24 hours. Nanocomposite containing smaller concentration of nanoparticles exhibited antibacterial activity, as revealed by the formation of larger inhibition halos. Nanocomposite incorporated with smaller concentration of nanoparticles showed inhibition halos of 2.10 cm for E. coli and 3.80 cm for S. aureus. Bactericidal potential of the HPMC/TiO$_2$ nanocomposites against bacterial growth is indicative that the nanocomposites can be used in food packaging as active antimicrobial internal coatings.