

## Preparation, Characterization, and in-Vitro Drug Release Study of Methotrexate-Loaded Hydroxyapatite-Sodium Alginate Nanocomposites

**Authors :** Friday G. Okibe, Edit B. Agbaji, Victor O. Ajibola, Christain C. Onoyima

**Abstract :** Controlled drug delivery systems reduce dose-dependent toxicity associated with potent drugs, including anticancer drugs. In this research, hydroxyapatite (HA) and hydroxyapatite-sodium alginate nanocomposites (HASA) were successfully prepared and characterized using Fourier Transform Infrared spectroscopy (FTIR) and Scanning Electron Microscopy (SEM). The FTIR result showed absorption peaks characteristics of pure hydroxyapatite (HA), and also confirmed the chemical interaction between hydroxyapatite and sodium alginate in the formation of the composite. Image analysis from SEM revealed nano-sized hydroxyapatite and hydroxyapatite-sodium alginate nanocomposites with irregular morphologies. Particle size increased with the formation of the nanocomposites relative to pure hydroxyapatite, with no significant change in particles morphologies. Drug loading and in-vitro drug release study were carried out using synthetic body fluid as the release medium, at pH 7.4 and 37 °C and under perfect sink conditions. The result shows that drug loading is highest for pure hydroxyapatite and decreased with increasing quantity of sodium alginate. However, the release study revealed that HASA-5%wt and HASA-20%wt presented better release profile than pure hydroxyapatite, while HASA-33%wt and HASA-50%wt have poor release profiles. This shows that Methotrexate-loaded hydroxyapatite-sodium alginate if prepared under optimal conditions is a potential carrier for effective delivery of Methotrexate.

**Keywords :** drug-delivery, hydroxyapatite, methotrexate, nanocomposites, sodium alginate

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