EXAMINATION OF HYDROXYAPATITE APPLICATION AS A POTENTIAL QUERCETIN - CARRYING MATERIAL

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Abstract

The objective of this work was to investigate a naturally occurring mineral form of calcium apatite, known as hydroxyapatite (Hap), as a potential drug delivery material. Drug delivery materials are utilized to effectively administer drugs to the body, ensuring controlled release, targeted delivery, and enhanced bioavailability. Hydroxyapatite was selected for its widespread use in biomedical applications, attributed to its exceptional biocompatibility, bioactivity, and osteoconductivity. As the main mineral component of human bone and teeth, it is highly appropriate for medical and dental implants, coatings, and bone grafts. Moreover, hydroxyapatite exhibits low biodegradability under physiological conditions, and its surface can be modified to improve protein adsorption and cell attachment, ensuring stability for long-term use. Hydroxyapatite was prepared for drug delivery purposes using the wet precipitation method of NaH_2PO_4 + H_2O into $Ca(OH)_2$. This solution was magnetically stirred, and the pH of the mixture was adjusted with NH_4OH to create an alkaline environment at a temperature of around 80 °C. The adsorption experiment was conducted with the well-known flavonoid quercetin, chosen due to its challenging bioavailability, attributed to factors such as low aqueous solubility, a short metabolic period, and toxicity. A quercetin solution was prepared in ethanol with a concentration of 5 ppm. The adsorption experiment was carried out over 24 hours with constant stirring at room temperature. The results were analyzed using a UV-VIS spectrophotometer. Quercetin exhibits two peaks in the UV-VIS spectrum that are between 240–280 nm and 340–440 nm. Results showed that 3,3 mg/g of quercetin was attached tothe hydroxyapatite surface.It was also shown that quercetin was attached to the surface of the hydroxyapatite by intermolecular interactions. The most dominant one is the hydrogen bond, which belongs to the group of dipole-dipole interactions, that occur between the hydroxyl groups of quercetin and the oxygen atoms of the phosphate group in hydroxyapatite.

Keywords: *drug-carrier, hydroxyapatite, quercetin, adsorption, UV-VIS spectrum, hydrogen bond*

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