

## Controlled Release of Glucosamine from Pluronic-Based Hydrogels for the Treatment of Osteoarthritis

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**Abstract :** Osteoarthritis affects a lot of people worldwide. Local injection of glucosamine is one of the alternative treatment methods to replenish the natural lubrication of cartilage. However, multiple injections can potentially lead to possible bacterial infection. Therefore, a drug delivery system is desired to reduce the frequencies of injections. A hydrogel is one of the delivery systems that can control the release of drugs. Thermo-reversible hydrogels can be beneficial to the drug delivery system especially in the local injection route because this formulation can change from liquid to gel after getting into human body. Once the gel is in the body, it will slowly release the drug in a controlled manner. In this study, various formulations of Pluronic-based hydrogels were synthesized for the controlled release of glucosamine. One of the challenges of the Pluronic controlled release system is its fast dissolution rate. To overcome this problem, alginate and calcium sulfate ( $\text{CaSO}_4$ ) were added to the polymer solution. The characteristics of the hydrogels were investigated including the gelation temperature, gelation time, hydrogel dissolution and glucosamine release mechanism. Finally, a mathematical model of glucosamine release from Pluronic-alginate-hyaluronic acid hydrogel was developed. Our results have shown that crosslinking Pluronic gel with alginate did not significantly extend the dissolution rate of the gel. Moreover, the gel dissolution profiles and the glucosamine release mechanisms were best described using the zeroth-order kinetic model, indicating that the release of glucosamine was primarily governed by the gel dissolution.

**Keywords :** controlled release, drug delivery system, glucosamine, pluronic, thermoreversible hydrogel

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