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Fabrication of Antibiotic Loaded Silk Fibroin Nanoparticles for Controlled Drug Release

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Abstract—*Nanoparticles have gained much interest of scientific community around the world because of their ability to be used as drug carriers to deliver drug "effectively". These were first developed around the 1970s by Birrenbach and Speiser to be used as drug carriers [1]. This relatively new application of nanoparticles in the area of drug delivery can be attributed to the unique characteristics they display due to their nano ranged size. Nanoparticles may prevent drug degradation, they have also shown to enhance biological stability, improved drug absorption into tissue, increased bioavailability and retention time [2]. Also, modulation in surface properties, composition gives us the desired drug release pattern and bio-distribution [3].*

Nanoparticles synthesized from natural polymers have shown excellent biodegradability and biocompatibility [4]. These nanoparticles have better encapsulation and controlled drug release properties. Several natural polymers such as polysaccharides, including chitosan, cellulose and starch as well as proteins namely silk fibroin, gelatin, collagen, albumin and elastin are also used [2]. In our study, the regenerated silk fibroin solution was obtained by degumming raw silk fibers obtained from domesticated silk worm Bombyx mori. This solution was further used to synthesize silk fibroin nanoparticles using desolvation method.

A broad spectrum antibiotic, amoxicillin was loaded on this nanoparticles and an in-vitro drug release was performed to study drug release characteristic of antibiotic loaded silk nanoparticles. Biphasic release profile with initial burst release followed by controlled release of drug were observed. The highest cumulative percentage release being almost 35% in 24 hrs. The versatility of this drug delivery platform for various drugs was tested by studying release profile of three antibiotic with differing molecular weight and chemistries. The insight gained in this study will help in designing most robust drug delivery system.

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