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Topic of the Speech:
Silk-based Controllable Drug Delivery and Biomedical Applications

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ABSTRACT SUBMISSION
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Silk-based Controllable Drug Delivery and Biomedical Applications

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ABSTRACT (NO MORE THAN 500 WORDS:)

Silk is a natural material that has broad applications from textile biomedical engineering area to controlled drug delivery area. One of the most attractive property is controllable secondary structural transition of α-helix and β-sheet, which can be used to modulate its degradation rate and release rate of encapsulated drugs. In our recent studies, we have designed and prepared several formulations from silk-based nanoparticles, nanofibrous matrix to microneedles, to achieve controllable drug delivery for improving biomedical applications, such as anticancer effects and antibacterial effects. For nanoparticle formulation, we have prepared a serial curcumin-silk nanoparticle (<100 nm) by solution-enhanced dispersion via supercritical CO_2, which showed improved solubility, enhanced anticancer effect on colon cancer cells (HCT116), antifungal activity against *Candida albicans* and antibacterial effect against *Pseudomonas aeruginosa*. Meanwhile, A silk nanofibrous structure with controllable fiber diameter (<100 nm) was produced. The drug release rate of the silk-based nanofibrous drug delivery platform was controlled by adjusting the secondary structural transition of α-helix and β-sheet. *In vitro* anti-cancer (HCT116) results indicated that curcumin-silk nanofibrous matrix had a superior anti-cancer potential when the concentration was >5 μg/mL. Recently, we have developed a wearable silk-based microneedle, containing of a thermal-responsive microneedle patch with double layers, flexible control circuit, a heating-film, and a smartphone-based application (APP) for controllable drug delivery and combined therapeutic strategy. In a summary, silk is a promising material for textile biomedical engineering and other biomedical areas.