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Abstract

A Thermoresponsive Injectable Microparticles/Hydrogel Drug Delivery System for Cancer Treatment †

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Drug delivery systems (DDS) are systems that aim to deliver drugs/bioactive agents to the human body in a controllable and sustainable way. Microparticles are structures that have been intensively studied as DDS in several studies within the biomedical field. However, microparticles suffer from early burst release and a great amount of their cargo is released in a short period. The incorporation of the microparticles within a thermoresponsive hydrogel to form an injectable DDS is a viable way that can prolong the release of the particles' content [1]. Since the hydrogel will form a barrier between the particles and the in vivo environment, the cargo will need to pass through these two barriers to be released. It is known that the particles will affect the transition temperature of thermoresponsive particles/hydrogel systems [1]. The transition temperature of the DDS should be between 24 °C (above the operating room temperature) and 36 °C (below body temperature of 37 °C) to assure that the system is in the sol state at the operating room temperature and in the gel state within the body. In this study, particles made with alginate and gellan gum were produced via co-axial air flow and then mixed with a Pluronic F127:F68 solution (20 wt%; 16:4). The effect of the particles content was analyzed. A rheological evaluation with oscillatory temperature ramps was carried out to determine the transition temperature of the DDS. The results showed that these systems are suitable for injectable thermoresponsive DDS for biomedical treatments.

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Reference

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