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Ultrasonic enhancement of drug release from microspheres

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Abstract

This study investigates the role of ultrasound in anticancer drug delivery loaded on microspheres The 5-flurouracil (5-FU) chitosan microparticles were prepared by the chemical cross-linking method. A total of 80 male Swiss albino mice weighting (20-25 g) received subcutaneous injections of 2x106 (Ehrlich ascites carcinoma) cells mammary in origin. A week later, the tumor bearing mice were divided into four main groups: group of 20 mice serves as a control untreated group, group of 20 mice which were injected with 5-FU only, group of 20 mice which were injected with blank chitosan microspheres, and a group of 20 mice which were injected with 5-FU chitosan microspheres. Each group was divided into two subgroups, i.e., 10 mice each, where one group was treated with ultrasonic waves and the other subgroup received no treatment with ultrasonic waves. Calculations were made 14 days after treatment in order to compare the volumes, inhibition ratios of the tumors and survival curves of each group. Results obtained indicate that tumor volume delayed 28 days by combined treatment of 5-FU chitosan microparticles and ultrasound than that with 5-FU chitosan microparticles alone.

Key words: *Drug delivery, Cancer, 5-flurouracil, Chitosan microparticles*

1. Introduction

Microencapsulation techniques have become more and more popular in the last few decades because they offer significant advantages as the material used to coat the drug particles which create a physical barrier and thereby enhance the stability of the particle (Gao *et al*., 2006).

Microspheres, made of polymeric materials, offer enormous potential to be used as carriers for anti-cancer drugs due to their biodegradable nature and proven biocompatibility (Costa and Cardoso, 2006). Incorporation of a drug within biodegradable, biocompatible injectable microspheres has been shown to be a promising approach for drug delivery (Ravi, 2000).

Encapsulation of a drug into microspheres decreases systemic concentration of the free drug, which diminishes intracellular drug uptake by normal cells and reduces unwanted side effects caused by drug interaction with healthy tissues. However, encapsulation of the drug into microspheres also decreases its uptake by cancerous cells (Munshi *et al*., 1997; Marin *et al*., 2001). To overcome

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