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Fabrication of Fucoxanthin-Loaded Microsphere (F-LM) By Two Steps Double-Emulsion Solvent Evaporation Method and Characterization of Fucoxanthin before and after Microencapsulation

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Abstract

Microencapsulation is a promising approach in drug delivery to protect the drug from degradation and allow controlled release of the drug in the body. Fucoxanthin-loaded microsphere (F-LM) was fabricated by two step w/o/w double emulsion solvent evaporation method with poly (L-lactic-co glycolic acid) (PLGA) as carrier. The effect of four types of surfactants (PVA, Tween-20, Span-20 and SDS), homogenization speed, and concentration of PLGA polymer and surfactant (PVA), respectively, on particle size and morphology of F-LM were investigated. Among the surfactants tested, PVA showed the best results with smallest particle size (9.18 pm) and a smooth spherical surface. Increasing the homogenization speed resulted in a smaller mean F-LM particle size [d(0.50)] from 17.12 to 9.18 pm. Best particle size results and good morphology were attained at homogenization speed of 20 500 rpm. Meanwhile, increased PLGA concentration from 1.5 to 11.0 (% w/v) resulted in increased F-LM particle size. The mean particle size [d(0.5)] of F-LM increased from 3.93 to 11.88 pm. At 6.0 (% w/v) PLGA, F-LM showed the best structure and external morphology. Finally, increasing PVA concentration from 0.5 to 3.5 (% w/v) resulted in decreased particle size from 9.18 to 4.86 pm. Fucoxanthin characterization before and after microencapsulation was carried out to assess the success of the microencapsulation procedure. Thermo gravimetry analysis (TGA), glass transition (Tg) temperature of F-LM and fucoxanthin measured using DSC, ATR-FTIR and XRD indicated that fucoxanthin was successfully encapsulated into the PLGA matrix, while maintaining the structural and chemical integrity of fucoxanthin.

Keywords

Author Keywords: fucoxanthin; microsphere; microencapsulation; w/o/w double emulsion; solvent evaporation method

KeyWords Plus: DRUG-DELIVERY; PLGA-MICROSPHERES; IN-VITRO; POLYLACTIDE MICROSPHERES; PULMONARY DELIVERY; CONTROLLED-RELEASE; WATER; MICROPARTICLES; ACID; MICROCAPSULES

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