

Co- delivery of Venlafaxine and Doxycycline by films of Cellulose Nanofibers for diabetic foot ulcers

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Abstract:

Introduction:

About 15-25% of diabetic patients suffer from foot ulcers. Diabetic foot ulcers often require specialized treatment and multidisciplinary approach. the choice of appropriate drug delivery system for antibiotics and pain refiner is an important remedy. Venlafaxine is an antidepressant drug of the serotonin-norepinephrine reuptake inhibitor (SNRI) class which is a safe and well-tolerated analgesic drug for neuropathic pain in diabetic's foot ulcers. On the other hand Doxycycline inhibits metalloproteinases activity through the chelation of calcium and zinc ions which inhibits extra cellular matrix destruction mediated by metalloproteinases. Films of cellulose nanofibers are biocompatible with excellent physical properties and can be appropriate choice for wound dressing in diabetic foot ulcers.

In the present study, films of cellulose nanofibers were loaded by Venlafaxine and Doxycycline for simultaneous delivery to diabetic foot ulcers.

Methods and Results:

Doxycycline and Venlafaxine were dissolved in 10 cc water and then Films were putted on them and stirred for 24 hours to reach or until drugs are loaded drugs loading. Drug loading efficiency and release profiles were investigated by UV spectroscopy in 275 and 225 nm, respectively. The influence of the pH from 3 to 9 and the ratio of the drugs to carrier (1:1, 1:2 and 1:3) were assessed on the drug loading and release profiles. Efficiency of drugs loading was decreased by increase in pH possibly due to the negative charge of cellulose and positive charge of Venlafaxine and Doxycycline in lower pH. On the other hand, the ratio of 1:2 of drugs to carrier was the most efficient ratio for drug loading that was 20% and 69% and also, 60% and 35% release for Venlafaxine and Doxycycline respectively.

Conclusions:

Films of cellulose nanofibers proved to be an appropriate carrier for co-delivery of Venlafaxine and Doxycycline as wound dressing. Further clinical studies are needed to evaluate their effectiveness in alleviating the inflammation and neuropathic pain of the diabetic foot ulcers.

Key words: Cellulose nanofibers, Co-delivery, Doxycycline, Venlafaxine, Diabetic foot ulcers