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Enhancement of 2, 4-Dichlorophenoxyacetic Acid Solubility via Solid Dispersion Technique

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Abstract : Objective: 2,4-Dichlorophenoxy acetic acid (2,4-D) is a well-known herbicide widely used as a weed killer. Recently, 2,4-D was rediscovered as a new anti-inflammatory agent through in silico as well as in-vivo experiments. However, poor solubility of 2,4-D could represent a problems during pharmaceutical development in addition to lower bioavailability. Solid dispersion (SD) refers to a group of solid products consisting of at least two different components, usually a hydrophobic drug and hydrophilic matrix. It is well known technique for enhancing drug solubility. Therefore, selecting SD as a tool for enhancing 2,4-D could be of great interest to the formulator. Method: In our project, several polymers were investigated (such as PEG, HPMC, citric acid and others) in addition to drug polymer ratios and its effect on solubility. Evaluation of drug polymer interaction was investigated through both Fourier Transform Infrared (FTIR) and Differential Scanning Calorimetry (DSC). Finally, in-vivo evaluation was performed for the best selected preparation through inflammatory response of rat induce hind paw. Results: Results indicated that, citric acid 2,4-D and in ratio of 0.75 : 1 showed modified the dissolution profile of the drug. The FTIR resltes indicated no significant chemical interaction, however DSC showed shifting of the drug melting point. Finally, Carragenan induced rat hind paw edema showed significant reduction of the drug solid dispersion in comparison to the pure drug, indicating rapid and complete absorption of the drug in solid dispersion form. Conclusion: Solid dispersion technology can be utilized efficiently to enhance the solubility of 2,4-D.

Keywords : solid dispersion, 2,4-D solubility, carragenan induced edema
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