

Abstract

Objective: There have been significant advances in the additive manufacturing techniques such as 3D printing over the past 30 years; so that they are considered the industrial revolution of the 21st century. These methods can be replaced for most of the traditional and conventional drug manufacturing methods. Attempts are now being made to provide individualized treatment based on individual differences. Individual pharmacotherapy or individual therapy is so effective in meeting the patients' needs for treatment of the special diseases based on the individual anatomical and physiological differences, drug sensitivities, genetic polymorphisms, and the needed dosage. 3D printing has a high accuracy and it will soon be used for large scale production. By using 3D printing, unique products can be produced quickly and at low prices, so that these products can not be produced by conventional methods.

Aphthous ulcers has no specific cause. The patients affected by this condition usually suffer from an unfavorable feeling and pain for a long time. There is no effective drug for treatment of this complication. The products available in the treatment of oral lesions include soluble cocktails, topical pastes, mouthwashes and herbal drops that have a temporary effect and are washed off the site with saliva.

Method: Due to the problems in the treatment of oral ulcers and the inefficiency of pharmaceutical products in this field, a suitable drug delivery device was made using the 3D printing method using a warm syringe printing. In this method, low temperature is used to soften the polymers and there is no need to use organic solvent and it will not be toxic to the patient and printing will be done through a syringe with a specific nozzle size. In these patches, we loaded betamethasone.

Result: Patches containing betamethasone were printed using beeswax and poly vinyl alcohol polymers. The resulting patches had a smooth surface and was flexible. The patches contained 3.2 mg of betamethasone, which was released slowly over 4 hours. Electron microscopy showed well the order of the patch structure and drug loading.

Conclusion: The use of 3D printers in the pharmaceutical industry realizes the possibility of increasing the accuracy and precision of drug dosage by manufacturing layer by layer products. The prepared formulation was well printed by the warm syringe printer and also all the patches had a soft texture and flexibility. Various polymers and excipients can be used in the production of oral patches. Depending on the type of material and their percentage composition, the properties of the final patches will vary in terms of flexibility and drug content and drug release profile.

Key words: Oral patch, 3D printer, polyvinyl alcohol, beeswax, betamethasone and Aphthous ulcers