3D printing: An appealing route for customized drug delivery systems

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Abstract

In the recent decade, three-dimensional (3D) printers started to grow strongly in the field of drug delivery and personalized medicine, as they can tailor dosage forms according to the needs of each individual. This review gives an overview on the basic principles of layer-by-layer building of pharmaceutical dosage forms using different types of 3D printers. Also, the effect of infill percentage and pattern, raster orientation, layer thickness, thermal processing parameters on the printed formulations is highlighted. Additionally, the complex designs constructed by the 3D printers in order to modify the product shape, density, mucoadhesion and drug release are recapitulated. This review summarizes numerous applications for 3D printing in building drug-loaded structures including tablets, scaffolds, implants, microneedles, capsules, films, hydrogels, mouthguards, tubes, stents, vaginal suppositories and rings as well as in pediatric field. Finally, we suggest further investigational researches to aid in the widespread of 3D printing in the industrial pharmaceutical field. The 3D printing technology is expected to revolutionize drug delivery systems through customization of pharmaceutical formulations.

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