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3D Printing of Dual Tablets: Modified Multiple Release Profiles for Personalized Medicine

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Abstract : Additive manufacturing technologies producing drug dosage forms aimed at personalized medicine applications are promising strategies with several advantages over the conventional production methods. One of the emerging technologies is 3D printing which reduces manufacturing steps and thus allows a significant drop in expenses. A decrease in material consumption is also a highly impactful benefit as the tested drugs are frequently expensive substances. In addition, 3D printed dosage forms enable increased patient compliance and prevent misdosing as the dosage forms are carefully designed according to the patient's needs. The incorporation of multiple drugs into a single dosage form further increases the degree of personalization. Our research focuses on the development of 3D printed tablets incorporating multiple drugs (candesartan, losartan) and thermoplastic polymers (e.g., KlucelTM HPC EF). The filaments, an essential feed material for 3D printing,wereproduced via hot-melt extrusion. Subsequently, the extruded filaments of various formulations were 3D printed into tablets using an FDM 3D printer. Then, we have assessed the influence of the internal structure of 3D printed tablets and formulation on dissolution behaviour by obtaining the dissolution profiles of drugs present in the 3D printed tablets. In conclusion, we have developed tablets containing multiple drugs providing modified release profiles. The 3D printing experiments demonstrate the high tunability of 3D printing as each tablet compartment is constructed with a different formulation. Overall, the results suggest that the 3D printing technology is a promising manufacturing approach to dual tablet preparation for personalized medicine.

Keywords : 3D printing, drug delivery, hot-melt extrusion, dissolution kinetics
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