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Enhancing Drug Incorporation in FDM 3D-Printed Tablets Using Pan Coating Technique

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Drug incorporation into Fused Deposition Modelling (FDM) printed tablets can be achieved either by hot melt extrusion (HME) of drug loaded filaments or impregnation of filaments or the printed devices. With HME, the drug and polymer are first melted together and then extruded using a heated nozzle. While, impregnation involves immersing in a highly concentrated drug solution. Loading drug into 3D-printed tablets by deposition of active pharmaceutical ingredient solution by controlled spraying of liquid droplets with pan coating may be novel, automated, accurate, and reproducible alternatives for loading. The project aims the comparison of loading methods to produce paracetamol containing polylactic acid (PLA) based FDM printed tablets. A FDM printer was used to print plain tablets with a honeycomb infill shape. A Pan coater was used for spraying of paracetamol solution onto the 3D printed tablets. The resulting tablets were assessed for drug content, friability%, drug distribution (Raman mapping), Structural Analysis (FT-IR), and dissolution performance. More than 85% loading was achieved for pan coating technique. Paracetamol tablets met USP standards with a weight loss of less than 1%. No appearance or disappearance of peaks was observed in FT-IR analysis, indicating drug-polymer compatibility. Raman mapping showed that the API was distributed mainly on the surface of tablets. Over 80% release in 30 minutes was observed. FDM combined with controlled post-printing drug loading presents a rapid, cost-effective, and flexible novel approach for manufacturing personalized immediate-release tablets.

References:

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