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Fused Deposition Modeling Three-Dimensional Printing (FDM-3DP) of Channelled Tablets with Ketoprofen: Design, Development and Pharmaceutical Evaluation

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Three dimensional printing (3DP) constitutes an innovative approach in the pharmaceutical field with promising potential for the production of personalized medicine, among the available techniques Fused Deposition Modeling (FDM) representing a flexible, simple and cost-effective alternative. The aim of the present study was obtaining and evaluating a channelled tablet model produced by FDM-3DP, using custom made pharmaceutical polymer-based filaments.

Ketoprofen, a nonsteroidal anti-inflammatory drug (NSAID) was selected as the model active pharmaceutical ingredient (API), while polyvinyl alcohol (PVA) represented the matrix forming polymer with thermoplastic behaviour in which the API was included. Feedstock filaments were obtained by hot melt extrusion (HME), followed by FDM-3DP of the tablets. Assessment of the final product included pharmacotechnical characterization and in vitro dissolution studies.

Results demonstrated the feasibility of higher drug loaded, printable filaments. Plasticization was achieved by elevated API content, generating custom made filaments with proper mechanical and rheological properties. In vitro dissolution testing revealed a complete release of the drug up to 4h. Humidity was identified as a factor which could impact the quality of the dosage form, subsequently preventive measures are required during preparation and storage. Production of pharmaceutical dosage forms by a bi-phase technique such as FDM- coupled with HME creates opportunities to improve safety, efficacy and accessibility of medications. FDM-3DP is a versatile tool which could be developed as a single platform qualified to adapt dosage forms based on patients' needs, preferences or individual features.

References

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