BIOFILAMENTS DERIVED 3D PRINTED MEDICATED SKIN PATCH: DESIGN TO DELIVERY

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Background: Quercetin in combination with polyvinylpyrrolidone (PVP) was found to limit the spreading of necrosis to unaffected tissues in tuberculosis infected mice. Therefore, we hypothesized that 3D printed medicated skin patch incorporated with quercetin-PVP concentration would provide an appropriate therapeutic drug concentration with desired sustained release profile.

Methods: We fabricated quercetin-PVP bio-filaments by hot melt extrusion (HME) technique along with Eudragit® RSPO and tri-ethyl citrate as plasticizer and further 3D printed it to make medicated skin patches using fused deposition modelling (FDM). Various characterizations were performed to optimize the 3D printed patch formulation.

Results: *Ex-vivo* skin permeation study with optimized T_1 patch showed tri-phasic release pattern governing the Higuchi based diffusion mediated release kinetics. Additionally, optimized patch was assessed using SEM, DSC, and XRD studies to confirm the conversion of crystalline quercetin into amorphous form. Finally, pharmacokinetic profile of this optimized patch was studied in rats showed prolonged T_{max}, lowered C_{max}, and reduced fluctuations in plasma concentrations till 18 days with single skin application of 3D printed medicated patch.

Conclusions: Overall data confirmed the feasibility of developing 3D printed medicated skin patches to provide plasma levels for continued 18 days in rats after a single application.