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Fabrication of Fast Dissolvable Micro needle Patch for Transdermal Delivery of Simvastatin

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Fast dissolving microneedles are one of the emerging approaches designed to enhance drug delivery involving minimal invasion. Herein, we report fast dissolvable microneedle (F-dMN) patches as a novel tool for better systemic delivery of Simvastatin in a patient friendly manner. Polyvinyl alcohol (PVA) and Polyvinylpyrrolidone (PVP) were used in the development of F-dMN patch. Developed formulations were characterized through SEM, FTIR, PXRD, dissolution testing, tensile strength, elongation (%), mechanical strength, skin irritation studies, and pharmacokinetic evaluation. Optimized F-dMN patch (G6) exhibited excellent elongation (35.17%), tensile strength (9.68MPa), moisture content (5.65%), penetration potential (~560µm) and Simvastatin release of 81.75%. Pharmacokinetic properties of fast dissolvable microneedle patches were also improved i.e., Cmax 6.974 µg/ml, tmax 1hr and AUC 19.518µg.h/ml as compared to tablet Simva solution thus confirming improved bioavailability. Kinetic modelling revealed hixson-crowell as best fit model for G6, based on regression coefficient. Histopathological findings proved good biocompatibility of the developed F-dMN patch. Moreover, stability studies (axial needle fracture force and drug content) of developed optimized microneedles patches confirmed the stability of the developed F-dMN patch.

Keywords: Simvastatin, Microneedle Patches, Hixson-Crowell, Stability.

Biography

Zulcaif with a MPhil (1st Class) in Pharmacy from Riphah International University in 2019. Following a year of Pre-Registration training spent in Hospital Pharmacy, he joined School of Pharmacy at The University of Lahore to undertake a PhD in Pharmaceutics. He submitted PhD thesis in 2022 and appointed to a Lectureship in Pharmaceutics in September 2022 at The University of Lahore. Zulcaif research is centered on design and physicochemical characterization of advanced polymeric drug delivery systems for transdermal and topical drug delivery, with a strong emphasis on improving therapeutic outcomes for patients. His bio-adhesive patch design was used in successful photodynamic therapy of over 100 patients with neoplastic and dysplastic gynecological conditions and the patent subsequently out-licensed. Currently, Zulcaif research is focused on novel polymeric microneedle arrays for transdermal administration of "difficult-to-deliver" drugs.

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