In-Vitro Skin Permeation and Biological Evaluation of Lornoxicam Monolithic Transdermal Patches

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Abstract

Transdermal patch is a promising approach that allows continuous input of drugs with short biological half-lives. The present study was designed to evaluate the short $t_{1/2}$ lornoxicam (LX) transdermal patches through in-vitro skin permeation, skin irritation and biological evaluation on rat induced paw edema. LX patches were prepared using different polymer blends and plasticizers. The effect of Span80 and Transcutol® as permeation enhancers in absence and presence of oleic acid (OA), isopropyl myristate (IPM), triacetine and castor oil, on transdermal permeation through rat skin, was investigated. The safety of LX patches was evaluated through skin irritation study. The biological evaluation regarding the anti-inflammatory effect of LX patches on rat paw edema was tested. The following were the principal findings of this research. First, there was very good correlation between LX flux and the presence of IPM, Oleic as well as propylene glycol compared to other oils and triacetine. Second, span80 had significantly improved LX permeation from Eudragit blends (E100), while combining transcutol- castor oil showed no remarkable increase in drug flux. Third, the primary irritancy index (PII) proved the non-irritancy of the drug or any of the film components and showed that the innovated films are safe to be applied to skin for the intended period of time. Finally, LX patches had significantly inhibited the carrageenan induced rat paw edema compared to oral treatment. This study has supplied us with brightening results concerning the questionable equipotent therapeutic efficacy of transdermal versus oral LX and not irritant to skin.

Keywords: Lornoxicam, Transdermal patches, Inhibition of edema, Irritation test

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References

Formulation, Characterization and Clinical Evaluation of Micro Emulsion Containing Clotrimazole For Topical Delivery

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Abstract

The objective of the present study was to formulate and evaluate microemulsion systems for topical delivery of Clotrimazole (CTM). The solubility of CTM in various oils was determined to select the oil phase of microemulsion systems. Pseudoternary phase diagrams were constructed to identify the area of microemulsion existence. Five CTM microemulsion systems were prepared. These systems were evaluated by assessment of thermodynamic stability, measurements of pH, refractive index, droplet size and viscosity, and in vitro release across cellulose membrane. Of these systems, M3 (lemon oil/tween 80/n-butanol /water) and M4 (isopropyl myristate/tween 80/n-butanol /water) liquid microemulsion systems were found to be promising. Both M3 and M4 in their liquid and gelled forms were evaluated for their drug retention in the skin in comparison to marketed CTM cream (Canesten® cream). Stability studies for six months at 4 and 40°C were carried out for M3 and M4 liquid microemulsions. The studies showed that M4 was more stable than M3. Then M4 system in its liquid and gelled forms was evaluated for the antifungal activity against Candida albicans in comparison to Canesten® cream. There was a significant higher antifungal activity of M4 and gelled M4 against Candida albicans in comparison with Canesten® cream (p<0.01). Also clinical efficacy evaluation of the prepared gelled M4 was assessed and proved the tolerability and efficacy of this preparation in the treatment of various topical fungal infections.

Keywords: Clotrimazole, microemulsion, skin retention, topical cream, topical gel

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References
Guar Gum and Hydroxy Propyl Methylcellulose Compressed Coated Tablets for Colonic Drug Delivery: *In Vitro* and *In Vivo* Evaluation In Healthy Human Volunteers.

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Abstract

The objective of the present study was to evaluate guar gum in combination with hydroxy propyl methylcellulose (HPMC) as compression coat for colonic delivery of prednisolone. The core tablets containing 5 mg prednisolone were compression coated with different coat weights using different ratios of guar gum and HPMC. The compressed coated tablets were evaluated for their physical properties, *in vitro* drug release and *in vivo* performance in human volunteers. The prepared tablets exhibited acceptable physical properties regarding hardness, friability, and drug content uniformity. In vitro drug release in simulated gastrointestinal fluids showed minimal drug release (≤ 8%) in the first 5 hours. At the end of 24 hours, the amount of drug released was slightly increased. While in presence of 2% rat caecal content, the drug release showed up to 100% release after 24 hours. In *in vivo* gamma scintigraphic study in human volunteers using technetium 99m DTPA as a tracer was performed. The results showed that tablets remained intact in stomach and small intestine, however partial and complete distribution of the tracer occurred in the colon. In conclusion, guar gum in combination with HPMC would be successfully used as a carrier for drug delivery to the colon.

*Keywords*: Guar gum - hydroxy propyl methylcellulose - compressed coated tablets colonic drug delivery- prednisolone - gamma scintigraphy

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*References*

Evaluation of Mucoadhesive Hydrogels Loaded with Diclofenac Sodium–Chitosan Microspheres for Rectal Administration


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Abstract

Considering the advantageous for the rectal administration of non-steroidal anti-inflammatory drugs, the objective of this study was to formulate and evaluate rectal mucoadhesive hydrogels loaded with diclofenac-sodium chitosan (DFS-CS) microspheres. Hydroxypropyl methylcellulose (HPMC) (5, 6 and 7 %w/w) and Carbopol 934 (1% w/w) hydrogels containing DFS-CS microspheres equivalent to 1% w/w active drug were prepared. The physicochemical characterization revealed that all hydrogels had a suitable pH for rectal application (6.5-7.4). The consistency of HPMC hydrogels showed direct proportionality to the concentration of the gelling agent, while carbopol 934 gel showed its difficulty for rectal administration. Farrow's constant for all hydrogels were greater than one indicating pseudoplastic flow. In-vitro drug release from the mucoadhesive hydrogel formulations showed a controlled drug release pattern, reaching 34.6-39.7% after 6 hr. The kinetic analysis of the release data revealed that zero-order was the prominent release mechanism. The mucoadhesion time of 7% w/w HPMC hydrogel was 330 min, allowing the loaded microspheres to be attached to the surface of rectal mucosa. Histopathological examination demonstrated the lowest irritant response to the hydrogel loaded with DFS-CS microspheres in response to other forms of the drug.

Keywords: Diclofenac sodium-chitosan microspheres, rectal mucoadhesive hydrogel, HPMC, Carbopol 934, Histopathological study

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References

Optimization and Characterization of Diclofenac Sodium Microspheres Prepared By Modified Coacervation


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Abstract

A modified coacervation method for preparing diclofenac sodium loaded chitosan (DFS-C) microspheres, using sodium citrate as crosslinking agent was optimized. A full 23 factorial design was used to evaluate the effect of chitosan (CS) concentration, cross-linking agent concentration, and cross-linking time on the properties of the prepared microspheres. The modified coacervation method resulted in higher yield of spherical microspheres even with a lower concentration of CS (0.3%, w/v). The morphology of the microspheres was found to be dependent on the formulation and process parameters. The cross-linking agent concentration had the largest impact on swelling, mucoadhesion, and drug release. Kinetic analysis of the release data revealed a quasi-Fickian diffusion mechanism.

Keywords: Diclofenac sodium, chitosan microspheres, modified coacervation, factorial design

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References
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Nineteen years of academic and industrial experience in Pharmaceutics; experience in formulation and analytical laboratories including pre-formulation, stability test and solid dosage form development. Taught and conducted research in drug delivery systems, technology and targeting in microparticles; radio-pharmaceuticals; transdermal drug delivery using radioactive permeants, permeation promoters and chemical enhancers. Research has resulted in twenty two publications in international journals and twelve presentations at international conferences. Supervised Ph.D. and undergraduate students. Consultant in research and development to the pharmaceutical industry.