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Antimicrobial Evaluation of Polyphenon 60 and Ciprofloxacin Loaded Nano Emulsion against Uropathogenic Escherichia coli Bacteria and Its in vivo Analysis

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Abstract : Our aim is to develop a nanoemulsion-based delivery system containing polyphenon 60 (P60) and ciprofloxacin (Cipro) for intravaginal delivery to treat urinary tract infection. In the present study Polyphenon 60 (P60) and ciprofloxacin (Cipro) were loaded in a single nano emulsion (NE) system via ultra-sonication technique and characterized for particle size, in vitro release and antibacterial efficacy against Bcl-2 level Escherichia coli bacteria. To determine in vivo pharmacokinetic parameters and intravaginal transportation of NE, gamma scintigraphy and biodistribution study was conducted by radiolabelling NE with technetium pertechnetate (99mTc). The preliminary antibacterial investigation showed synergy between these compounds with FICindex of 0.42. The developed formulation showed zeta potential +55.3 and particle size of 151.7 nm, with PDI of 0.196. The in vitro release percentage of P60 at the end of 7th hours was 94.8 ± 0.9 % whereas the release for Cipro was 75.1± 0.15 % in simulated vaginal media. MBC was identified and the findings demonstrated that in both ESBL (Extended Spectrum β- lactamase) and MBL (Metallo β- lactamase) cultures the P60+Cipro NE showed inhibition of growth of all the isolates at 2 mg/ml dilutions. The percentage per gram of radiolabelled drug was found (3.50±0.26) and (3.81±0.30) in kidney and urinary bladder, respectively at 3 h. From the findings, it was concluded that the developed P60+Cipro NE was transported efficiently throughout the target organs, had long duration of action and high biocompatibility via intravaginal administration as compared to oral administration.

Keywords : ciprofloxacin, gamma scintigraphy, intravaginal drug delivery, Polyphenon 60
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