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EUDRAGIT RL-100 AND PLURONIC F127 NANOPARTICLES FOR THE ORAL DELIVERY OF AMPICILLIN

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ABSTRACT

Industry leaders along with the World Health Organisation (WHO) are suggesting that the biggest threat to human health, and the reservation will come from what is deemed currently as antimicrobial drug resistance. With anti-microbial resistance being on the rise, it is imperative that large pharmaceutical companies allocate adequate financial resources towards the development of new anti-microbial agents. This is due to global slow economic growth and previously observed low return on investment (ROI) on developing these molecules ROI is more favoured to other therapeutic areas such as chronic ambulatory diseases. These two factors accentuate the problem that modern medicine in this indication will face soon. Innovative and unique methods for resolving this imminent thread mankind faces are desperately needed.

Advance drug delivery platforms can be utilised to overcome previous issues identified in anti-microbial treatment using mainstay oral dosing. These issues include low bio-availability, sub-optimal plasma concentrations, extensive first pass metabolism and toxicity leading to adverse drug reactions and associated severe side effects. All these issues have and are currently hindering the adequate treatment of non-superficial bacterial infections to achieve adequate and efficacious blood plasma concentrations for effective microbe eradication. This study was aimed at enhancing the physicochemical properties and dosing guidelines of previously excessively prescribed anti-microbial agents (such as β-lactams) employing nanoparticle technology. It is hypothesized that enhancing this drug class' delivery, will increase its current non-optimal physicochemical properties and dosing strategy. Various physicochemical experiments were conducted on nanoparticles (NP) consisting of Eudragit RL-100 and surfactant Poloxamer encapsulating ampicillin anhydrous as model drug. In this current study both the AMP-load Eudragit and Pluronic® F-127 NPs and the mainstay drug (Ampicillin) saw an initial spike in release in simulated gastric pH with a total offload percentage of 9.57% and 7.70% respectively in the first 30 min post dose.

There was however an increase of roughly 0.5% - 1.7% of additional drug off-loaded earlier from the nanoparticulate system following an oral formulation as compared to mainstay drug. Furthermore, drug encapsulation efficacy was equated at 66%. The study's key finding indicated that compared to baseline (traditionally dosed oral ampicillin) the release profile of ampicillin loaded within polymers illustrated a more sustained release in simulated gastrointestinal pH profiles with that would possibly result in a higher initial drug offload amount increasing plasma-drug concentration.

Keywords: Anti-microbial resistance, bioavailability, advance drug delivery platforms, pharmacokinetic testing, drug encapsulation, personalised medicinal dosing, nanoparticles, polymers