

Cosmoceutical and Therapeutic Potential of Isotretinoin Nanoparticulate Gel in Management of Acne

Jovita Kanoujia,¹ Alok Kumar Yadav,² Priyanka Maurya,³ Samipta Singh,⁴ Abhishek Yadav,⁵ Poonam Parashar^{6*}

Department of Pharmaceutical Sciences, Babasaheb Bhimrao Ambedkar University, Lucknow 226025, India

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*Corresponding author:

Poonam Parashar

Email:

poonamparashar79@gmail.com

ABSTRACT

This study intended to develop and evaluate isotretinoin (ITR) loaded nanoparticles taking chitosan as a polymer of interest. Ionic crosslinking method was utilized to prepare nanoparticles. Nanoparticles were formulated using varying ratios (chitosan: tripolyphosphate) and evaluated for its size, distribution of size, zeta potential, percentage of ITR entrapped within nanoparticles, *in vitro* drug release and its stability under accelerated conditions. The prepared nanoparticles (NPs) were spherical, white in color and free flowing, 321 ± 4.5 nm was the average size of optimized chitosan nanoparticles and it was able to entrap $88.76 \pm 3.5\%$. The outcomes assured vast promise of the CNs of ITR (optimized) in management of acne and also increasing the therapeutic efficacy, thus establish to be a promising, effective and patient compliant formulation.

INTRODUCTION

Acne, a cutaneous pleomorphic condition of the pilosebaceous unit involving sebum production rate anomaly and described by inflammatory (pustules, nodules and papules) as well as non-inflammatory comedones (closed and/or open) (Knutson, 1974). Regular pus-forming microbes *Propionibacterium acnes* and *Staphylococcus epidermidis* are responsible for development of many forms of acne vulgaris (Rawat, Tripathi *et al.*, 2015). It is a pleomorphic disorder and can manifest at any time during life but it most commonly occurs between ages of 12-24 years, accounting effective 85% of population (Cordain, Lindeberg *et al.*, 2002). *P. acnes* is an anaerobic microorganism existing in acne lesions that promotes inflammation through a variety of mechanisms and involved in producing pro-inflammatory mediators that diffuses through the follicle wall (Itoh, Tsuchida *et al.*, 2014).

Prominent in adolescence and puberty, acne is definitely associated with function of sebaceous gland, which stimulate higher secretion of sebum androgenically (Singh, Gangwar *et al.*, 2016). However, the consequential sebaceous glands abnormality due to hormonal changes modify the composition of sebum

and decrease content of linoleic acid (Kanlayavattanukul and Lourith, 2011). The primary pathogenic mediator responsible for acne vulgaris on skin and hair follicles is *P. acnes* (Cunliffe, Holland *et al.*, 2004). Thus, *P. acnes* has become a major pathogen of interest for researching for the treatment against acne vulgaris (Meraj Anjum, Kanoujia *et al.*, 2016).

Whether drug or cosmetic, a nanoparticle formulation has more advantages for their delivery to the skin over conventional formulations (Ghosh, 2000). Incorporated within nanoparticles, active ingredients are protected against chemical degradation and drug release can be modulated. Only well tolerated excipients are utilized and nanoformulations also provide feasibility of large scale production (Jafarinejad, Gilani *et al.*, 2012, Meraj Anjum, Kanoujia *et al.*, 2016). Chitosan (CN) is an interesting polymer used extensively in pharmaceuticals (Wang, Zeng *et al.*, 2011). CN based nanoparticles are used worldwide for different applications owing to their non-toxicity, biodegradability, high permeability and cost effectiveness (Wang, Zeng *et al.*, 2011). Being smaller in size, they are capable of passing through the biological barriers and deliver drugs to the lesion with improve efficacy (Saharan, Mehrotra *et al.*, 2013).