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Research Article

Design And Characterization Of Momentasone Nano-Formulation For The Treatment Of Topical Fungal Infection

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ABSTRACT

Nanoformulations are the novel generation of submicron sized lipid emulsions where liquid lipid (oil) has been partially substituted by solid lipid. Nanoformulations lipids used in the formulation are efficacious, safe, biodegradable, stable and biodegradable in nature. Nanoformulations offer various advantages for topical novel drug delivery like ability adaptation of deposition into skin with the reduced systemic exposure and reduced local side-effects along with providing sustained release of drug. Mometasone furoate (MF) is a topical glucocorticoid having anti-inflammatory, anti-pruritic, anti-hyper proliferative activity. Owing to these properties it is recommended in chronic inflammation and psoriasis. In market, MF cream and lotion (0.1%) are available, which show slight skin irritation, burning and common side-effects due to steroids. To overcome the shortcomings of conventional formulations, there is a need to develop a novel formulation that can reduce these side-effects and show maximum desired effects. Thus, Nanoformulations of MF can be prepared which would help in increasing skin deposition as well as provide sustained release. In this research study, Nanoformulations were prepared by solvent - injection method. The batches had shown maximum entrapment up to55.59% and sustained drug release for more than 10 h. The skin permeability of Nanoformulations loaded gel was found to be approx 15 times more than that of marketed branded nanoformulations cream. Nanoformulations loaded gel showed 82% of skin deposition which was 2.5 times more than marketed cream and 20 times more than plain drug loaded gel. The scanning electron microscopy and zeta potential study showed formation of good nanoformulations dispersion & dissolution. The stability adaptatipn study showed excellent successful formation of stable Nanoformulations. Thus, Nanoformulations proved the highly positive novel potential for topical novel drug delivery of corticosteroid drug over the conventional old formulations.

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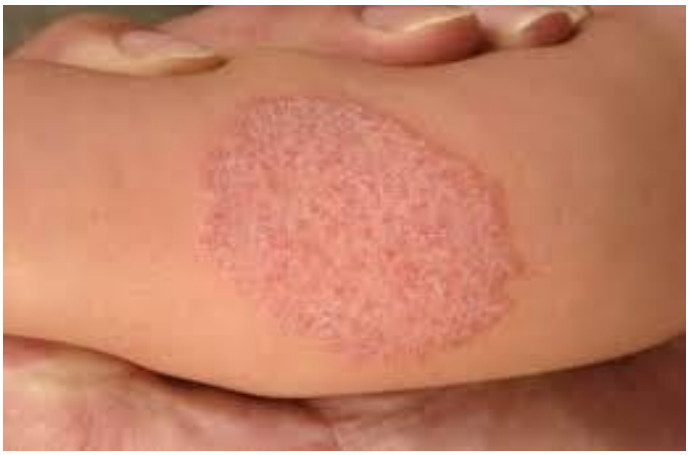
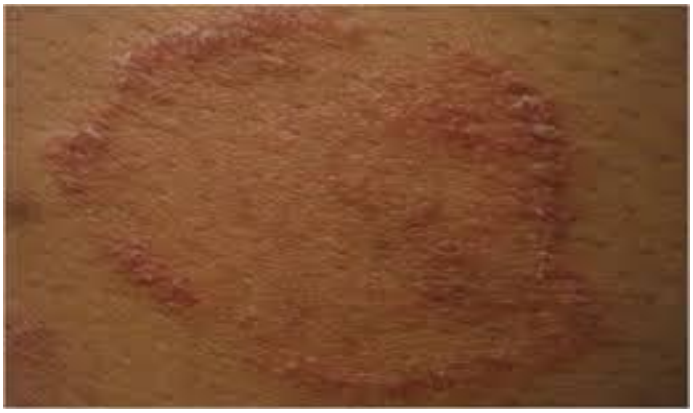
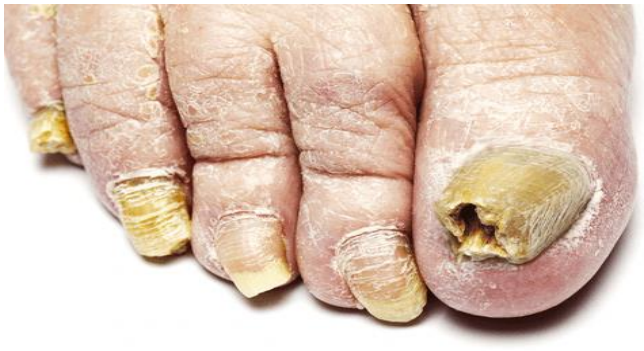
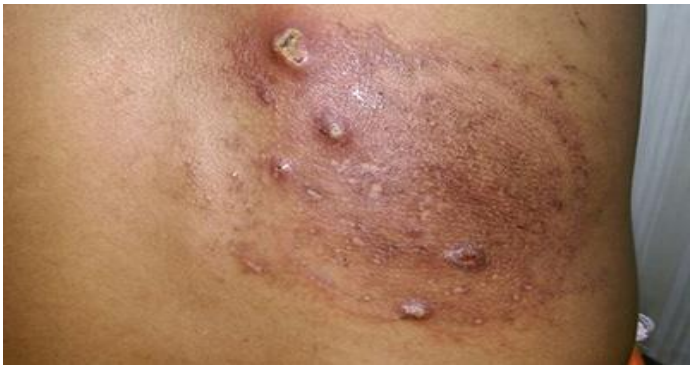
INTRODUCTION

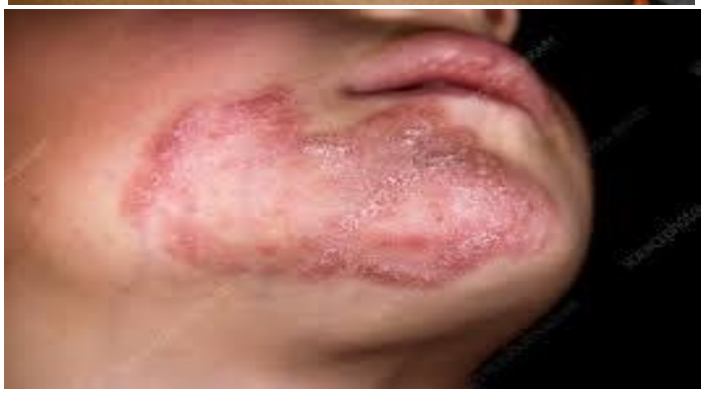
Fungal infections of the skin are one of the often faced with dermatological diseases in worldwide. Topical therapy is an attractive choice for the treatment of the cutaneous infections due to its advantageous such as targeting of drugs to the site of infection and reduction of the risk of systemic side effects. Currently, antifungal drugs are generally used as conventional cream and gel preparations in topical treatment. The efficiency of that treatment depends on the penetration of drugs through the target layers of the skin at the effective concentrations. However, stratum corneum, the outermost layer of the skin, is an effective barrier for penetration of drugs into deeper layers of the skin. The physicochemical characteristics of drug molecules and the types of the formulations are effective factors in topical drug delivery. Therefore, a number of formulation strategies have been investigated for delivering antifungal compounds through targeted site of the skin. This focuses on the new alternative formulation approaches to improve skin penetration of antifungal drugs.

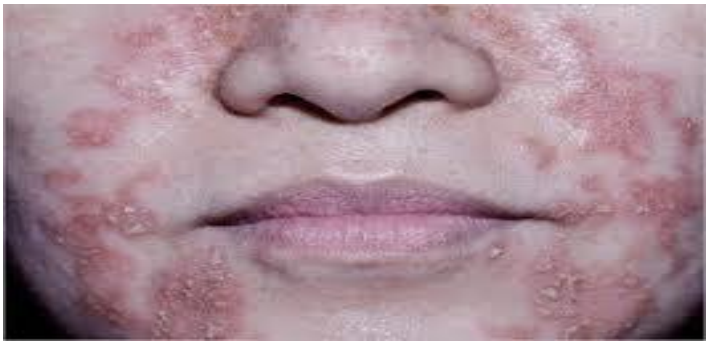


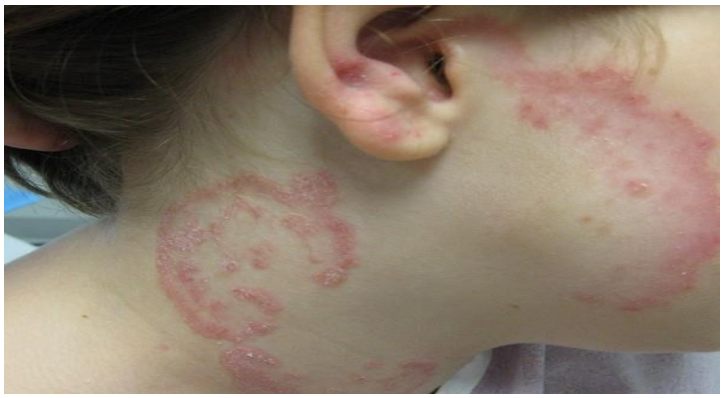












Mometasone, also known as mometasone furoate, is a steroid medication used to treat certain skin conditions, hay fever, and asthma. Specifically it is used to prevent rather than treat asthma attacks. It can be applied to the skin, inhaled, or used in the nose. Mometasone furoate, not mometasone is used in medical products.

Common side effects when used for asthma include headache, sore throat, and thrush. It is therefore recommended to rinse the mouth after use. Long term use may increase the risk for glaucoma and cataracts. Common side effects

when used in the nose include upper respiratory tract infections and nose bleeds. Common side effects when applied on the skin include acne, skin atrophy, and itchiness. It works by decreasing inflammation

Research Methodology –

(Materials Used)- Momentasone, Glycerol monostearate (GMS), Tefose-63, Syncrowax-HRC, Compritol 888, and Emulcire, palmitate, , Syncrowax-, Stearic acid, Tween-80, and Lipoid S-75 (Soya Lecithin) , Phospholipon-80 H,Ethanol, Acetone and Carbopol, Methyl paraben, Propyl-paraben, Triethanolamine

Batch No.	Drug (mg)	Tefose-63 (mg)	Ethanol	Tween-80 (mg)	Distilled Water	Avg. Mean Particle (nm)	EE%
A1	10	100	100	200	10	114.38	39%
A2	10	200	100	200	10	140.41	54.10%
A3	10	300	100	200	10	581.1	54.20%
A4	10	100	200	200	10	187.41	47.83%
A5	10	200	200	200	10	177.3	54.21%
A6	10	300	200	200	10	161.7	46.21%
A7	10	100	300	200	10	164.21	50.22%
A8	10	200	300	200	10	124	55.51%
A9	10	300	300	200	10	205	54.61%

Nanoformulations Preparation:

The MF loaded SLN dispersions were prepared using solventinjection method. The lipid phase was prepared by melting lipid and lipophilic surfactant together, i.e., GMS and Tefose-63 respectively. The solution of MF in ethanol was added to the melted lipid phase. This solution was taken in a glass syringe andwas injected rapidly into the aqueous phase containing Tween 80.

Nanoformulation Dispersion Characterization:

Mean particle size and size distribution of Momentasone loaded nanoformulations were determined by spectroscopy at room temperature (20-25 degree celcius).

Zeta Potential: The Charge on surface of Momentasone was being loaded through nanoformulations droplet was analysed & determined using Zetasizer 300 HAS.

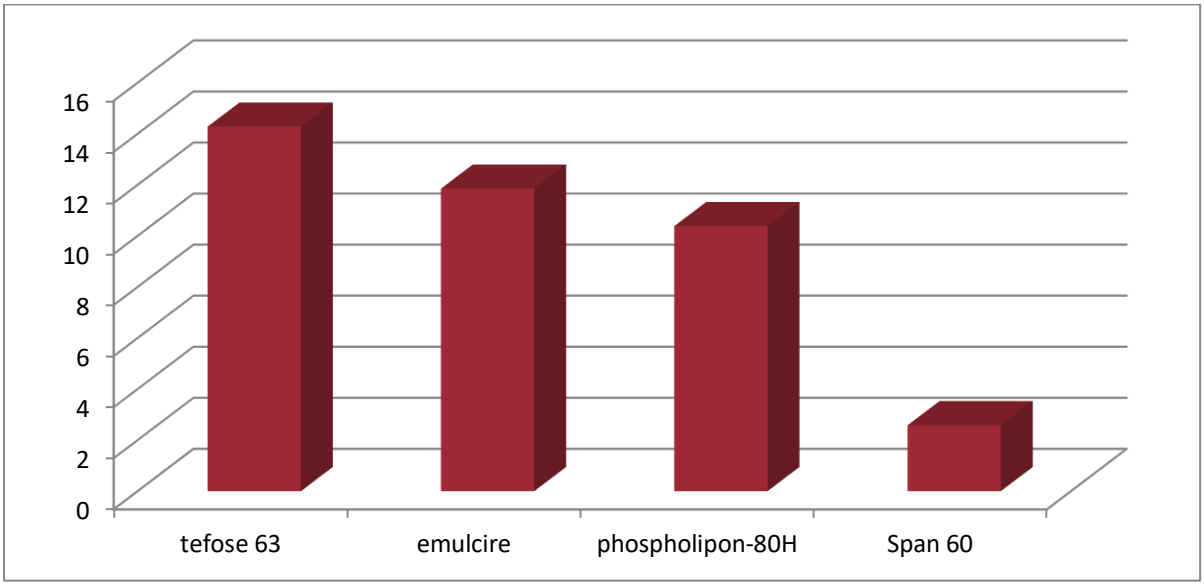
Characterization of Nanoformulations Dispersion:

Particle size: The amount of lipid has a great effect on particle size, since with small increase in amount of lipid, the particle size increases drastically (as seen with batches A1-A3). EE: The EE was found to increase with increasing concentration of both lipid and surfactant [above table. However an increase in lipid from 200 to 300 mg does not lead to further increase in % EE. Thus, there was no benefit of increasing lipid concentration further. Surfactant amount above 300 mg lead to formation of sticky solutions so the higher limit of surfactant was fixed to 300 mg. SEM analysis: The SEM micrographs of momentasone loaded nanoformulations; it clearly reveals that all the nanoformulations were spherical in shape and smooth in nature.

Physical Evaluation of Nano-formulation Gel

Batch	Plain Drug	Carbopol 974p	Nnaoformulation Drug w/w	Appearance Quality	uniformity	consistency	pH
P1	0.1	0.25	xxxx	Fluidy gel	Execellent	Execellent	6.3
P2	0.1	0.50	xxxx	Fluidy gel	Execellent	good	6.2
P3	0.1	0.75	xxxx	Firm Gel	Execellent	execellent	6.2
P4	xxxx	0.25	0.1	Firm Gel	Execellent	execellent	6.3
P5	xxxx	0.50	0.1	Fluidy Gel	Execellent	good	6.1
P6	xxxx	0.75	0.1	Firm Gel	Execellent	good	6.3

Saturation solubility of momentasone in lilpophilic surfactants



CONCLUSION:

The current research work could be concluded as successful formulations & production of nanoformulations using GMS as a solid lipid by solvent - injection novel embedded technique. Secondly, developed & formulated nanoformulation was fully utilized for the topical delivery of lipophilic, anti-fungal drug, Momentasone. Greater skin deposition and slow drug release was observed with the developed nanoformulations. Nanoformulations topical gel containing momentasone would be advantageous over the marketed cream product. Production of momentasone loaded nanoformulations and its formulation as a topical gel could be a new, cost-effective and commercially viable alternative to the marketed product.

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