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A Review On Emulgels: Transdermal Drug Delivery Of Miconazole

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Abstract

One of the most popular drug delivery methods is transdermal because it has several benefits, including simplicity of medication application, self-administration, reduced drug metabolism, etc. Despite these benefits, the route still has many drawbacks. The transfer of medications to the systemic circulation through the skin, vagina, ocular, and rectal channels is known as topical drug delivery. Topical formulations are used to treat skin conditions. Although gels have many benefits, hydrophobic medication delivery is one of their main drawbacks. Therefore, an emulsion-based technique is being employed to get around this restriction so that even a hydrophobic medicinal moiety can benefit from gels with special qualities. Emulgel is the name assigned to the dosage form developed by combining gels and emulsions. Emulgel is the promising delivery system for hydrophobic medicines. Emulgel is an emulsion that is gelled in combination with gelling agents. The use of gels is emerging in both cosmetics and pharmaceuticals compared to other semi-solid formulations. Among the many advantages of gels is the major limitation of hydrophobic drug delivery. Therefore, an emulsion-based approach is used to overcome this limitation. Emulgel has several beneficial properties for dermatological use, including Thixotropic, fat-free, easy to apply, easy to remove, flexible, non-staining, long shelf life, transparent and attractive appearance. Therefore, emulgel can be used as a better local drug delivery system than current systems.

Key-words: Miconazole Nitrate, Emulgel, Gel, Emulsion, Antifungal Activity

Introduction

Topical drug delivery is the delivery of drugs anywhere in the body through skin, vaginal, ophthalmic and rectal routes. Drugs may be given for localized or systemic effects.(1) Topical formulations with varying physicochemical properties, such as solid, semisolid, or liquid, can be developed. In this system different type of formulations are available like solid through semisolid to liquid. This drug delivery defined as the skin with the approach to increase its bioavailability and reduce their side effects. Topical formulations are prepared in different consistency such as solid, semisolid, and liquid. The topical delivery system is failed in the administration of hydrophobic drug. In each formulation with the active ingredients many excipients are used. Sometimes more than one formulation can be combined to enhance the drug delivery; emulgel is such type of combination. It is the combination of emulsion and gel. The primary benefit of a topical delivery system is that it avoids the first-pass metabolism. The term microemulsion is based on particle size. Due to their smaller size, the drug particles can easily diffuse through the skin and reach their site of action. The gel will hold the microemulsion for a long time and will aid in the sustained release of the drug. (2) An emulsion, on the other hand, is a mixture of two liquids that are normally immiscible, meaning they do not mix well. Emulsions are typically used in products like lotions, creams, and paints, and they consist of particles of one liquid suspended in the other [3]. A gel is a semi-solid, jelly-like substance that is composed of a network of particles suspended in a liquid or gas. A gel is made up of a polymer that enlarges when exposed to fluid and possibly within its structure. The amount of fluid entrapped in the gel determines its rigidity. These gels are wet and smooth, with the appearance of being solid. These are capable of significant physical deformation, from solid-state to liquid state[4]. Emulgel is just a mixture of gels and emulsions. Emulgel is emulsions, either o/w or w/o, which are gelled by combining with a gelling agent. Emulgel is more effective in curative aspects than regular gel. The conversion of an emulsion into the gel is accountable for improved stability and penetrability of emulsion. Moreover, this system exhibits dual control release which is attributed to both emulsion and gel. However, the stability and release of incorporated drugs in emulgel are affected by the type and concentration of gel-forming polymer. Emulgel also prolongs the contact period of medication over the skin owing to its mucoadhesive property [4-6].

Why use emulgels for drug delivery systems?

When applied to the skin, they are quite sticky, which makes things tough for the sufferer. Furthermore, they require rubbing and have a lower dispersal coefficient. Additionally, they also face a significant stability issue. All of these factors combined mean that within the main category of semisolid preparations, Transparent gels are now more often used in the manufacturing of medications and cosmetics. The gel is a colloid composed of a small quantity of gelatin and usually 99% water weight. It is immobilized by surface tension between the liquid and the macromolecular network of fibers. The delivery of hydrophobic medicines is one of gels' main advantages. Therefore, an emulsion-based innovation is being used to get around this restriction, enabling the effective incorporation of even a hydrophobic medicinal molecule [7]. Numerous common topical medications, such as ointments, creams, and lotions, have several drawbacks. When administered, they are quite sticky and make the patient uneasy. Additionally, they also have a less applying

coefficient and require rubbing in. Additionally, they display the instability issue. The usage of translucent gels in pharmaceutical and cosmetic preparations has increased as a result of all these aspects falling under the larger category of semisolid preparations. A gel is a colloid, usually composed of 99% water, that is kept immobile by surface tension between it and a network of macromolecules made of fibers that is formed from a tiny quantity of the gelating material that is present. Gels have many benefits, but one significant drawback is their inability to distribute hydrophobic medications. To get over this restriction, an emulsion-based strategy is being employed, which makes it possible to efficiently integrate and distribute a hydrophobic medicinal moiety through gel [8,9].

The majority of hydrophobic medications cannot be added straight to gel bases due to solubility acting as a barrier and creating issues with the drug's release. Emulgel facilitates the incorporation of hydrophobic medicines into the oil phase, which leads to the formation of an o/w emulsion by dispersing oily globules in the aqueous phase. Additionally, this emulsion can be blended with gel basis. Compared to just putting pharmaceuticals into a gel base, this might be showing greater drug stability and release [10,11].

This formulation has better loading capacity, stability, production feasibility and economic for production.

Miconazole nitrate [12]

Miconazole is an antifungal drug that treats ringworm, pityriasis versicolor, and vaginal or skin yeast infections. It is marketed under the trade name Monistat, among others. It is used to treat athlete's foot, ringworm of the feet, and jock itch in the groin. is used as a cream or lotion on the skin or vagina.Itching or discomfort of the area where it was applied are common side effects. Pregnancy-related use is thought to be safe for the unborn child. Miconazole belongs to the imidazole class of drugs. It functions by impairing fungi's capacity to produce ergosterol, a crucial component of their cell membrane (fig.01).

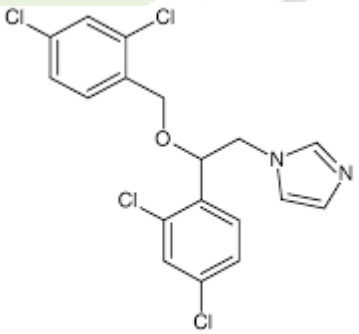

Fig.01 Miconazole chemical structure

Mechanism of action: Miconazole inhibits the fungal enzyme 14α-sterol demethylase, resulting in a reduced production of ergosterol. In addition to its antifungal actions, miconazole, similarly to ketoconazole, is known to act as an antagonist of the glucocorticoid receptor.

Pharmacokinetics: After application to the skin, miconazole can be measured in the skin for up to four days, but less than 1% is absorbed into the bloodstream. When applied to the oral mucosa (and possibly also for vaginal use), it is significantly absorbed. In the bloodstream, 88.2% are bound to plasma proteins and 10.6%

to blood cells. The substance is partly metabolized via the liver enzyme CYP3A4 and mainly eliminated via the feces.

Interactions Miconazole is partly absorbed in the intestinal tract when used orally, as with the oral gel, and possibly when used vaginally. This can lead to increased concentrations of drugs that are metabolized by the liver enzymes CYP3A4 and CYP2C9, because miconazole inhibits these enzymes. Such interactions occur for example with anticoagulants of the warfarin type, phenytoin, some newer atypical antipsychotics, ciclosporin, and most statins used to treat hypercholesterolemia. These interactions are not relevant for miconazole that is applied to the skin.

Side effects: Miconazole is generally well tolerated. The oral gel can cause dry mouth, nausea and an unpleasant taste in about 1–10% of people. Anaphylactic reactions are rare. The drug prolongs the QT interval.

Miconazole against fungal dermatitis

The causative agent, the host-fungus connection, the topography of the infection, the patient's age, gender, occupation, living situation, and overall health are all elements that should be taken into consideration when treating dermatomycoses [13]. A long-standing clinical trial has demonstrated miconazole's effectiveness in treating a variety of dermatomycosis kinds. miconazole is particularly useful in treating pityriasis (tinea versicolor), tinea corporis/cruris, tinea pedis, and cutaneous and mucosal candidiasis. Twice-daily applications of the 2% miconazole routine treatment are necessary for approximately three weeks or until recovery. Typically, the recovery process takes two to six weeks. Onychomycosis relapses have been demonstrated to be effectively prevented by miconazole powder [13].

C. albicans is primarily responsible for flexural candidosis, which primarily affects the groin area, axillae, interdigital spaces, and sub mammary and lower abdominal skin folds. In contrast, the sub mammary and abdominal skin fold regions are rarely affected by dermatophyte infection [14]. Individuals who suffer from flexural candidosis are typically middle-aged or older, and they frequently have diabetes and are overweight. Axillary candidiasis is unusual; however, it can happen to the same patients. A crucial differential diagnosis in the groin and axillae is erythrasma. Any Candida infection should be treated with miconazole [15]. miconazole is an adjuvant treatment for diaper dermatitis caused by Candida infection and flexural atopic dermatitis [16].

Since many long-term fungal infections, especially those that affect the foot, are co-infected with many staphylococci, the antibacterial action of miconazole is significant in these cases. These bacteria most likely have a pathogenic function in the lesion's persistence [17]. Regarding miconazole, it was suggested that the synergistic effects of antifungal and antibacterial activity could account for the quick recovery of certain dermatomycoses, especially those involving mixed fungal-bacterial infections [18]. The pathogenic function of the bacteria is to maintain the tissue changes. Notably, mixed fungal bacterial infections of the feet are more frequently caused by gram-negative bacteria. Fast healing is aided by miconazole's combination of antimycotic and sufficient antibacterial properties. miconazole may be employed to prevent mixed bacterial-

fungal situations [19]. miconazole's antifungal and antibacterial properties are beneficial. It is important to remember that during the preventative stage, the medication should target fungal propagules, such as yeasts, spores, and arthroconidia, rather than developing hyphae [20].

Conclusion

Miconazole is an effective antifungal agent used for topical fungal infections. It is a BCS class II drug and has a solubility problem. This molecule, it can be formulated in emulgel to get its maximum utilization. miconazole nitrate emulgel can be a stable topical dosage form with a sustained release effect by increasing the release of drugs in the form of emulgels.

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