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Formulation and Evaluation of Ornidazole Topical

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ABSTRACT :

Emulgels have shown promise as a topical drug delivery method for hydrophobic medications that are applied topically. The goal of the investigation was to make the medication ornidazole into an emulgel. Individually prepared emulsions have stability issues that affect the way drugs release when manufactured and stored. We are integrated as an emulgel to promote stability. An anti-protozoal medication called ornidazole is used to treat various protozoal infections of the stomach, intestine, genital area, and some strains of anaerobic bacteria as well as to avoid potential infections during surgery. The goal of the current study was to create and assess a topical ornidazole emulgel. . In this study, we develop an emulgel form of ornidazole using three distinct types of oils, including liquid paraffin, spearmint oil, and Japanese mint oil. Physical parameters such as colour, structure, solubility, homogeneity, consistency, swelling index, PH, and in vitro drug release patterns are examined for Carbapol 934, HPMC, and sodium alginate. The F3 formulation, or carbopol 940 with liquid paraffin, outperformed the other types of oils and polymers containing emulgels in terms of the drug release patterns.

KEYWORDS: Emulgels, topical drug delivery, and ornidazole are the keywords.

INTRODUCTION:

Application of a drug-containing formulation to the skin with the goal of directly treating cutaneous problems (such as acne and psoriasis) is known as topical delivery. the pharmacological or other effects of a medication on internal or external surfaces of the body. Their healthy and diseased skin received a wide range of aesthetic and dermatological preparations through diverse routes of topical medication administration. Topical preparations are applied to the surface of a region of the body, have effects only in that area, and are designed in a way that minimises the medication's systemic absorption. Solutions, suspensions, emulsions, and semisolids [such as powders and aerosols] are the most typical examples of topical dose forms.

MECHANISM :

The chemicals that can reversibly break down the stratum corneum's barrier resistance are known as skin penetration enhancers. They make it easier for medicines to reach healthy people.tissues and subsequently enter the body's circulatory system. The accelerants may via the intercellular pathway interact at the polar head groups of the lipids, between the hydrophobic tails of the barrier and between lipid head groups in the aqueous region. The typical mechanism is to shield the body from harmful environmental contaminants.

Emulgel :

Emulgels are emulsions, either of the oil-in-water or water in oil type which are gelled by mixing with gelling agent. Emulsified gel is stable one and superior vehicle for hydrophobic or poorly water soluble drugs. In short emulgels are the combination of emulsion and gel.

Uses Of Emulgels:

Ornidazole emulgel is a topical formulation that contains the active ingredient ornidazole, which is an antimicrobial agent. It is primarily used for the treatment of various dermatological conditions. Here are some common uses of ornidazole emulgel:

1. **Bacterial skin infections**: Ornidazole emulgel may be prescribed for the treatment of bacterial skin infections such as impetigo, folliculitis, and infected wounds. It helps to eliminate the causative bacteria and reduce inflammation.
2. **Acne**: Ornidazole emulgel can be used as part of the treatment regimen for acne. It has antimicrobial properties that help to control the growth of acne-causing bacteria, thereby reducing inflammation and preventing new acne lesions.
3. **Rosacea**: Ornidazole emulgel is sometimes used in the management of rosacea, a chronic skin condition characterized by redness, flushing, and pustules. It helps to reduce inflammation and control the overgrowth of bacteria associated with rosacea.

4. **Fungal infections**: In some cases, ornidazole emulgel may be used as an adjunct therapy for fungal skin infections, such as tinea versicolor or fungal groin infections. However, its primary use is not for fungal infections, and antifungal medications are generally preferred.
5. **Wound healing:** Ornidazole emulgel may be used to promote wound healing by preventing or treating infection in minor cuts, abrasions, and burns. The antimicrobial activity of ornidazole helps to reduce the risk of infection and facilitate the healing process.

It's important to note that the specific uses and availability of ornidazole emulgel may vary by country and region. It is always recommended to consult a healthcare professional, such as a dermatologist, for a proper diagnosis and guidance on the appropriate use of any medication.

Emulgel benefits include:

1. Patient acceptance is increased.
2. Offer specialised medicine delivery.
3. Simple therapy termination.
4. Increased bioavailability allows even modest doses to be effective as compared to other semi-solid traditional preparations.
5. More stable than transdermal preparations, which are generally less stable; powders are hygroscopic; creams exhibit phase inversion or breaking; and ointments exhibit rancidity as a result of oily base; stable formulation by reducing surface interfacial tensionresulting in an increase in the viscosity of the aqueous phase

Disadvantages :

1. Poor macromolecule absorption.
2. Bubble entrapment during formulation.
3. Drugs that are hydrophobic are the greatest candidates for these delivery methods.
4. An allergic or skin irritant reaction to contact dermatitis.
5. Only medicines with very low plasma concentration requirements can be used.
6. Drugs may become denatured by an enzyme in the skin.

Depending on the size of the droplets or the distribution method, there are various varieties of emulsions.

1. Macroemulsion gel
2. Nanoemulsion gel
3. Microemulsiongel

Materials and Method :

List of Materials Used in Emulgel Formulation

S. No.	Category	Examples
1	Vehicle (Aqueous phase)	Purified Water, Alcohols
2	Vehicle (Oil phase)	Mineral Oil, Soft/Hard Paraffin, Arachis Oil, Cottonseed Oil, Maize Oil
3	Emulsifiers	Span 80, Tween 80, Stearic Acid, Sodium Stearate
4	Gelling Agents	Carbopol-934 (1%), HPMC-2910 (2.5%), HPMC, Sodium CMC
5	Preservatives	Methyl Paraben, Propyl Paraben
6	Antioxidants	BHT, BHA, Ascorbyl Palmitate
7	Humectants	Propylene Glycol, Glycerin
8	Permeation Enhancers	Oleic Acid, Lecithin, Isopropyl Myristate, Urea, Menthol, DMSO, Pyrrolidone
9	Active Pharmaceutical Ingredient (API)	(To be specified as per the drug used)

List of Equipment Used in Emulgel Formulation

S. No.	Equipment Name	Purpose

1	Weighing Balance	Accurate weighing of materials
2	Magnetic Stirrer with Hot Plate	Homogenization and heating of phases
3	Homogenizer	High-speed mixing and emulsification
4	Beakers and Measuring Cylinders	Mixing and measuring liquids
5	pH Meter	Adjustment and monitoring of pH
6	Viscometer	Measurement of viscosity
7	Mechanical Stirrer	Mixing of gel and emulsion
8	Water Bath	Controlled heating of ingredients
9	Mortar and Pestle	Grinding and mixing solids if necessary
10	Storage Containers	Storage of finished emulgel for evaluation
11	Spatula	Mixing and transfer of semisolid products

FORMULATION OF EMULGEL.

Ingredients %w/w	F1	F2	F3	F4	F5	F6	F7	F8	F9
Drug	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Carbopol 940	1.00	1.00	1.00	-	-	-	-	-	-
Sodium hydroxide	Q.s	Q.s	Q.s	Q.s	Q.s	Q.s	Q.s	Q.s	Q.s
Spearmint oil	5ml	-	-	5ml	-	-	5ml	-	-
Ethanol	5ml	5ml	5ml	5ml	5ml	5ml	5ml	5ml	5ml
Jepanese mint oil	-	5ml	-	-	5ml	-	-	5ml	-
Liquid paraffin	-	-	10ml	-	-	10ml	-	-	10ml
Tween80	2ml	2ml	2ml	2ml	2ml	2ml	2ml	2ml	2ml
Propylene glycol	7ml	7ml	7ml	7ml	7ml	7ml	7ml	7ml	7ml
Methyl paraben	0.2ml	0.2ml	0.2ml	0.2ml	0.2ml	0.2ml	0.2ml	0.2ml	0.2ml
Propyl paraben	0.02ml	0.02ml	0.02ml	0.02ml	0.02ml	0.02ml	0.02ml	0.02ml	0.02ml
Purified water	TO 100	TO 100	TO 100	TO 100	TO 100	TO 100	TO 100	TO 100	TO 100

Preformulation study of ornidazole:-

S. No	Parameter	Method/Instrument Used	Observation/Result	Interpretation
1	Organoleptic Properties	Visual Inspection	White to light yellow crystalline powder	Acceptable appearance and texture
2	Solubility	Qualitative Solubility Test	Soluble in ethanol, slightly soluble in water	Indicates solubility profile for formulation
3	Melting Point	Melting Point Apparatus	86–88°C	Confirms purity and identity
4	Bulk Density	Bulk Density Apparatus	0.52 g/cm³	Helps determine powder flow
5	Tapped Density	Tap Density Tester	0.68 g/cm³	Used to calculate compressibility
6	Angle of Repose	Funnel Method	32.5°	Indicates fair flowability

7	Loss on Drying (LOD)	Hot Air Oven	<0.5%	Acceptable moisture content

Physical Examination: The prepared ornidazole emulgel formulations, when subjected for colour appearance, were transparent in Carbopol 934, white viscous in HPMC K 200, and brownish gummy in sodium alginate, creamy preparation with a smooth, homogenous texture and glossy appearance. Results have been discussed in the table

S.No	Formulation	Colour	Phase Separation	Gritiness	Homogenicity	Consistency
2	F3	White	None	-	+++	+++

Table- Physical properties Measurement of pH:

The PH values of all the prepared formulation ranged from 5.8 to 6.0, which is considered acceptable to avoid the risk of irritation upon application to the skin.

Table. Measurement of pH.

S.No	Formulation	Ph
2	F3	6.0

Spreadability Coefficient :

The values of spreadability indicate that the emulgel is easily spreadable by a small amount of shear. Spreadability of F3 was 5.7cm/sec, indicating spreadability of the emulgel containing ornidazole was good as compound to the marketed gel.

Table - Spreadability

S.No	Formulation	Diameter
2	F3	5.7

Rheological Studies :

The viscosity of different emulgel formulations was determined at 250 °C using a brook field viscometer. The emulgels were rotated at 20 (min) and 200 (max) rotations per minute with spindle 4

Table- Rheological studies.

S.No	Formulation	Viscosity
2	F3	2288.56

Swelling Index:

The swelling index of different formulations was observed and the data was shown in Table n.o. 22.

Table. Swelling Index

Time (min)	F3
0	2
25	2.22
30	2.3
45	2.26

Determination of Drug Content:

Drug content of each formulation was determined and data was shown in table n.o22. As shown in the tablet of drug content uniformly. The drug content uniformity of all the formulations was found to be ranging from 80% to 95% was observed that as the concentration of emulsifying agent increasing the drug content increased.

Table. Drug Content.

S.No	Formulation	Drug Content
2	F3	95%

Skin Irritation Test: No allergic symptoms like inflammation, redness, irritation appeared on rats up to 24hrs

Microbiological Assay:

Ornidazole's antiprotozoal activity in several emulgel formulations was tested, and percentage inhibition was used as a proxy for the drug's antiprotozoal action. As a result, F3 showed the highest level of activity and had the highest percentage of inhibition. compared to other formulations, to be 48.48

CONCLUSSION :

The goal of the current investigation was to increase the drug's skin absorption. Topical medicine delivery will be widely employed in the upcoming years to increase patient compliance. Ornidazole topical emulgels were created in the current work employing a variety of polymers, including Clove oil, menthol oil, liquid paraffin, tween 80, and carbopol 934 are some examples of the ingredients. Propylene glycol is utilised to increase penetration. In this investigation, several evaluation criteria, including physical appearance and pH, were used to all formulations. Evaluation, spreadability, swelling index, rheological studies, drug content, and in vitro drug release were all found to be within the acceptable ranges. However, the ornidazole topical emulgel formulation, which contains liquid paraffin as an oil and carbopol 934 as a polymer, exhibits a drug release of 93.2%, leading us to conclude that F3 formulation was the best formulation. he conclusion of formulations and evaluation of ornidazole topical emulgel depends on the specific study or research conducted. However, I can provide you with a general overview of what conclusions and evaluations may entail based on the characteristics and properties of ornidazole and emulgel formulations.

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