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Formulation and Evaluation of Lincomycin HCl Gels

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Lincomycin is an antibiotic active against most common gram positive and several anaerobic organisms. It has proved to be excellent for the treatment of skin conditions such as furunculosis, abscesses, carbuncles, cellulites, erysipelas, impetigo, infection burns and wounds. Gels were prepared using different gel forming agents such as carbopol-940, HPC, HPMC and PEG 6000 in different proportions. The formulations were evaluated for drug content, viscosity, pH, extrudability, homogeneity, Irritation test, spreadability and skin permeation studies through rat skin using kashery chein cell. Formulation F5 with carbopol 940 (1.5%) as the gel forming agent was found to be the best.

LYNCOMYCIN HCl is an antibiotic belonging to the group of lincosamides. It has proved to be excellent for the treatment of skin conditions such as furunculosis, abscesses, carbuncles, cellulites, erysipelas, impetigo, infected burns and wounds¹. It is presently available as capsules and injections and no topical preparation is available. As topical application of the drug at the affected site offers potential advantage of delivering the drug directly to the site of action, preparation and evaluation of lincomycin HCl gels was taken up in the present study.

Five different gel formulations were prepared using the formulae as shown in table 1. The gel forming agents (carbopol-940, HPMC, HPC, PEG 6000) were soaked in water and warmed if necessary. The drug was added to this followed by other ingredients and stirred to obtain the gels.

The drug content in the gels was determined by dissolving 1 g of the gel in water and estimating the drug by U.V. Spectroscopy at 194 nm. Viscosity of the gels was determined using a Brookefield's viscometer.

The extrudability of the formulations from the collapsible tubes was determined. Spreadability²

***For correspondence**

Table 1: Formulation of Mincomycin HCl Gels

Ingredients	F1	F2	F3	F4	F5
Lincomycin HCl (w/w)	0.5	0.5	0.5	0.5	0.5
Carbopol 940	1.0	-	-	-	1.5
HPC 400	-	10	-	-	-
HPMC 50 Cps	-	-	-	-	-
PEG 6000	-	-	-	5.0	-
Triethanolamine	0.5	-	-	-	0.5
Glycerin	10	10	10	10	10
Sodium CMC	-	-	-	3.0	-
Menthol	-	-	-	-	10
Methyl Salicylate	-	-	-	-	10
Water	88	79.5	79.5	81.5	77.5

The table indicates the different gel formulations (F1-F5) with varying polymer types and concentrations. The numbers indicate the percent of each ingredient in the composition of gel.

Table 2: Evaluation of Lincomycin HCl Gels

Formulations	Drug content (%)	Viscosity (CP)	Extrudability	Spreadability (g. cm/sec)	PH	Homogeneity	Irritation
F1	97.0	26.5	++	24.0	6.8	++	-
F2	98.5	24.2	+	8.0	6.4	++	-
F3	95.0	32.5	++	6.6	7.1	++	-
F4	96.0	22.5	+	7.5	6.34	++	-
F5	98.8	31.6	++	20.0	7.1	++	-

Note : ++ Good
 + Satisfactory
 - No irritation

The table indicates the various parameters studied of the gel formulations (F1 to F5).

was determined by a special apparatus and it was calculated using the formula $S=m.1/t$ where S =spreadability, m =weight tied to the upper slide, 1 =length of the glass slide and t =time taken.

pH measurements were made using a digital pH meter. The formulations were tested for homogeneity by visual observations. Test for irritation³ was performed on rabbit skin by applying 0.5 g of gel and observing for any irritation.

Table 3 : Skin Permeation Data of Lincomycin HCl Gels

Time (h)	F1	F2	F3	F4	F5
	(Cumulative amount in mg permeated/unit area \pm S.D.)				
1	0.747 \pm 0.020	0.881 \pm 0.018	0.758 \pm 0.025	0.652 \pm 0.015	0.923 \pm 0.023
2	0.853 \pm 0.023	0.948 \pm 0.019	0.874 \pm 0.027	0.702 \pm 0.015	1.022 \pm 0.002
3	0.937 \pm 0.018	1.023 \pm 0.014	1.063 \pm 0.012	0.819 \pm 0.022	1.112 \pm 0.021
4	0.984 \pm 0.010	1.107 \pm 0.013	1.063 \pm 0.012	0.905 \pm 0.014	11.164 \pm 0.010
5	1.048 \pm 0.023	1.184 \pm 0.025	1.167 \pm 0.018	1.007 \pm 0.010	1.233 \pm 0.028
6	1.096 \pm 0.020	1.247 \pm 0.010	1.230 \pm 0.021	1.089 \pm 0.009	1.289 \pm 0.019
7	1.225 \pm 0.018	1.317 \pm 0.025	1.368 \pm 0.029	1.189 \pm 0.014	1.351 \pm 0.021
8	1.347 \pm 0.025	1.379 \pm 0.018	1.468 \pm 0.025	1.273 \pm 0.021	1.555 \pm 0.015

The values indicate the amount of drug permeated/unit area of the rat skin for a period of 8 h using the Kashery Chien Cell.

Skin permeation studies of the prepared gels were carried out using Kashery Chein Cell⁴ rat skin at 37°. 1g of the gel (Containing 5 mg of drug applied on an area of 2 cm²) and citrate phosphate buffer of pH 7.2 were used for the study⁵. The medium was withdrawn periodically at the interval of 1 h for a period of 8 h and the drug content was estimated. The results obtained are shown in tables 2 and 3.

From the results, it is clearly evident that all the gel formulations showed good extrudability, homogeneity and spreadability. The formulations' viscosity ranged from 22.5 to 32.5 cp and they did not produce any skin irritation (table 2). The drug content was in the range of 95% to 98.5%. The pH of all the formulations was between pH 6 and pH 7 which lies in the normal pH range of the skin⁶. However, from the skin permeation studies it was observed that formulation F5 with carbopol 940 (1.4%) as the gel forming agent was found to have maximum permeation and hence considered to be the best.

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