



Formulation and Evaluation of Thermostable Gel for Acne treatment using Clindamycin

Vikash Kumar^{1*}, Rajendra Chauwkse¹ and Girendra Kumar Gautam²

1, Bhagwant Institute of Pharmacy, Muzaffarnagar (U.P.) - India

2, Shri Raam College of Pharmacy, Muzaffarnagar (U.P.) - India

Article info

Received: 07/12/2019

Revised: 31/12/2019

Accepted: 21/01/2020

© IJPLS

www.ijplsjournal.com

Abstract

The medium for formulation of a gel is selected according to its desired application. The medium could be one or more solvents depending upon the use of the gel. Methodology: Formulation of Clindamycin-ZAD topical thermostable gel for Acne treatment: Hydrogel is a network of polymer chains that are hydrophilic, sometimes found as a colloidal gel in which water is the dispersion medium. Hydrogels are highly absorbent (they can contain over 99% water) natural or synthetic polymers. Result and Discussion: As a result of these experiments, we have arrived at a final formula for the topical application of gel to be used in Acne Vulgaris containing Clindamycin Phosphate.

Key-words: Gel, Acne, Clindamycin

Introduction

Acne vulgaris is one of the commonest skin disorders which dermatologists have to treat. It mainly affects adolescents, though it may be present at any age. Acne by definition is multifactorial chronic inflammatory disease of pilosebaceous units. Various clinical presentations include seborrhoea, comedones, erythematous papules and pustules, less frequently nodules, deep pustules or pseudocysts, and ultimate scarring in few of them. Acne has four main pathogenetic mechanism—increased sebum productions, follicular hyper keratinization, Propionibacterium acne (*P. acne*) colonization, and the products of inflammation. In recent years, due to better understanding of the pathogenesis of acne, new therapeutic modalities are being designed. Availability of new treatment options to complement the existing armamentarium should help to achieve the successful therapy of greater numbers of acne

patients, ensure improved tolerability and fulfil patient expectations. Successful management of acne needs careful selection of anti-acne agents according to clinical presentation and individual patient needs. Gels are semisolid preparations intended for application on the skin or the accessible mucous membranes like oral cavity.

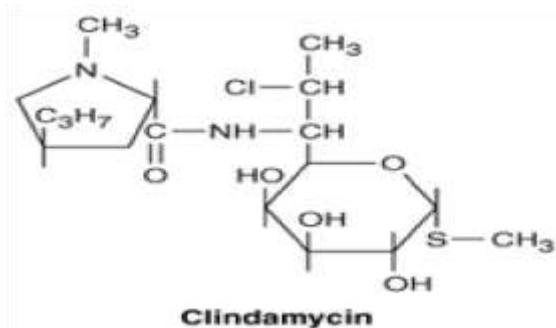
A gel is formed by creating a balance between the polymer and the solvent. A critical concentration yields the gel, also known as the gelling point, below this point the gel cannot be formed while above this point the viscosity increases greatly. The gelling point can be determined using the hydrophilic and lipophilic balance of the polymer, solvent and polymer interaction, uniformity in the structure, molecular weight of the polymer and flexibility of the polymer chain.

***Corresponding Author**

Many polymers, including natural ones like xanthan gum, starch, gellan, konjac, carrageenans, collagen, fibrin, silk fibroin, hyaluronic acid and gelatin, form gels by several main mechanisms as discussed by Gasperini. These are often usefully temperature sensitive in terms of viscosity change, but thermoresponsive design will increasingly be combined with synthetic features that relate to specific monomeric inclusion that may transduce to a thermal signal or act independently. However, innovative types are also often thermally responsive in terms of outputs other than viscosity or volume, examples being opacity, colour (thermochromic), hydrophobicity and electroconductive.

Clindamycin phosphate

Clindamycin is a lincosamide antibiotic with primarily bacteriostatic action against Gram positive aerobes and wide range of anaerobic bacteria.



Pharmacokinetics

Food does not interfere with absorption of clindamycin. Only ~10% clindamycin is excreted unchanged in the urine, and small quantities are found in the faeces. Though, antimicrobial activity continues in faeces for 5 days after parenteral therapy with clindamycin is stopped; growth of clindamycin-sensitive microorganisms in colonic substances may be inhibited for up to 2 weeks.

Material and Methods

Materials used in preparation of Thermostable Gel for Acne treatment

Clindamycin phosphate (CP) [Sarvasya Trading Pvt. Ltd, Surat]

Zinc acetate dihydrate (ZAD)

Ethanol

Propylene glycol

Carbopol 940

Hydroxypropyl cellulose

Sodium carboxymethyl cellulose (Na-CMC)

Hydroxyethyl cellulose

Guar-gum

Sodium hydroxide (NaOH).

Evaluation of thermostable gel

Physical appearance: The physical appearance and homogeneity of the prepared gels were tested by visual observations.

Spread ability test: Spread ability can be determined by applying the gel over an even surface and observed for the gritty nature of the hydrogel if present.

Results and Discussion

Characterization of Pure Drug (Clindamycin Phosphate)

Test	Specification	Result
Colour	White	Confirms
Physical State	Crystalline Powder	Confirms
Identification	Melting point – 208°C to 211 °C	209°C
pH of 10% water solution	3.5 to 4.5	3.9

Selection of gelling agent for formulation –

Trial bathes with different gelling agents were formulated and were initially visually observed for their appearance and viscosity. Their consistency/viscosity were checked. Consistency/viscosity of formulations prepared using Hydroxyethyl cellulose was found superior to other gelling agents and physical appearance was also better. Hence, it was selected for further analysis and optimization.

Effect of different concentration of zinc acetate dihydrate on complex formation – To formulate a stable CP-ZAD Complex concentration of ZAD was varied and its effect on viscosity of complex was observed.

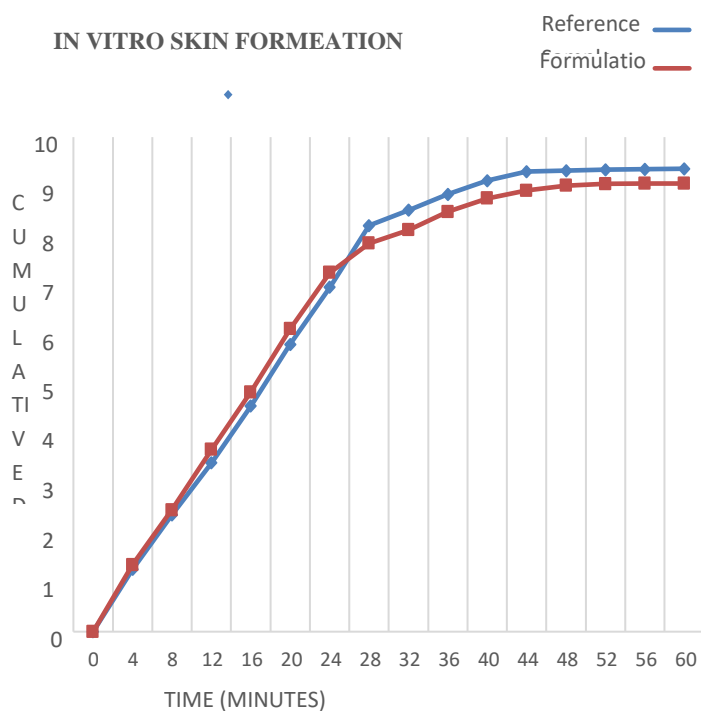
Conclusion

Based on the various studies carried out in the formulation trials, we arrived to the following conclusions: Zinc acetate dihydrate forms stable complex with Clindamycin

Sl. No.	Zinc acetate dehydrate 10% w/w solution (100 mg/ml)	Observation
1	100 mg	Less viscous complex
2	200 mg	Less viscous complex
3	300 mg	Less viscous complex
4	400 mg	Moderately viscous complex
5	500 mg	Complete viscous complex
6	600 mg	More viscous complex
7	700 mg	Highly viscous complex

Effect of concentration of ZAD on Viscosity of Complex.

Phosphate at pH 7.5 pH and Viscosity were found to be satisfactory. API Content (Assay) and RS at stability conditions were found to be within range as per US Pharmacopoeia.



References

- Piette WW, Taylor S, Pariser D, et al. Hematologic safety of dapsone gel, 5%, for topical treatment of acne vulgaris. *Arch Dermatol* 2008;144:1564–70
- O’Neil M. *The Merck Index*. 14th ed. Whitehouse Station (NJ): Merck; 2006. p. 153.
- Ascenso A, Raposo S, Batista C, Cardoso P, Mendes T, Praça FG, et al. Development, characterization, and skin delivery studies of related ultradeformable vesicles: Transfersomes, ethosomes, and transethosomes. *Int J Nanomedicine* 2015;10:5837-51.
- Shen S, Liu SZ, Zhang YS, Du MB, Liang AH, Song LH, et al. Compound antimalarial ethosomal cataplasm: Preparation, evaluation, and mechanism of penetration enhancement. *Int J Nanomedicine* 2015;10:4239-53.
- Mistry A, Ravikumar P. Development and evaluation of azelaic acid based

- ethosomes for topical delivery for the treatment of acne. *Indian J Pharm Educ Res* 2016;50:232-43.
6. Mbah C, Builders P, Nzekwe I, Kunle O, Adikwu M, Attama A. Formulation and in vitro evaluation of pH-responsive ethosomes for vaginal delivery of metronidazole. *J Drug Deliv Sci Technol* 2014;24:565-71.
 7. Celia C, Cilurzo F, Trapasso E, Cosco D, Fresta M, Paolino D, et al. Ethosomes® and transfersomes® containing linoleic acid: Physicochemical and technological features of topical drug delivery carriers for the potential treatment of melasma disorders. *Biomed Microdevices* 2012;14:119-30.
 8. Maestrelli F, Capasso G, González-Rodríguez ML, Rabasco AM, Ghelardini C, Mura P, et al. Effect of preparation technique on the properties and in vivo efficacy of benzocaine-loaded ethosomes. 2009;19(4):253-260.
 9. Strauss JS, Krowchuk DP, Leyden JJ, et al. Guidelines of care for acne vulgaris management. *J Am Acad Dermatol* 2007;56:651–63
 10. American Association of Clinical Endocrinologists Polycystic Ovary Syndrome Writing Committee American Association of Clinical Endocrinologists position statement on metabolic and cardiovascular consequences of polycystic ovary syndrome. *Endocr Pract* 2005;11:126–34.
 11. Gollnick H, Cunliffe W, Berson D, et al. Management of acne: a report from a global alliance to improve outcomes in acne. *J Am Acad Dermatol* 2003;49(Suppl 1):S1–37
 12. Webster GF, Guenther L, Poulin YP, et al. A multicenter, double-blind, randomized comparison study of the efficacy and tolerability of once daily tazarotene 0.1% gel and adapalene 0.1% gel for the treatment of facial acne vulgaris. *Cutis* 2002;69 (Suppl):

Cite this article as:

Kumar V., Chauwkse R. and Gautam G.K. (2020). Formulation and Evaluation of Thermostable Gel for Acne treatment using Clindamycin, *Int. J. of Pharm. & Life Sci.*, 11(1): 6459-6462.

Source of Support: Nil

Conflict of Interest: Not declared

For reprints contact: ijplsjournal@gmail.com