

Formulation and Evaluation of Benzyl Benzoate Emulgel

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Abstract: The aim of the following research was to formulate benzyl benzoate in emulgel form and to evaluate the release of the medicament from it. Emulgel containing 25% w/w of benzyl benzoate was prepared by addition of a gelling agent; Carbopol 934 to an emulsion using Span 80 as emulsifying agent. The release of benzyl benzoate was determined by Franz diffusion cell using cellulose acetate membrane for a period of five hours at 32°C. Benzyl benzoate was analyzed by ultra-violet (UV) Spectrophotometer at 256 nm. The prepared formula of benzyl benzoate emulgel proved to be more efficient than other externally applied topical preparations as lotion, ointment and gel.

Keywords: benzyl benzoate; Carbopol 934; emulgel; Franz diffusion cell

I. Introduction

In recent years, emulgel formulations have been developed for a number of drugs intended for topical or systemic action [1]. When gels and emulsions are used in combined form the dosage form is referred as emulgel [2]. It is prepared by mixing an oil-in-water type or water-in-oil type emulsion with a gelling agent. Direct (oil-in-water) system is used to entrap lipophilic drugs whereas hydrophilic drugs are encapsulated in the reverse (water-in-oil) system. Emulgel allows dual control of drug release from the formulation, i.e. emulsion and gel.

Preparation of emulgel

Gelling agents (Carbopol 940, Carbopol 934) were dispersed in purified water. The pH 6-6.5 was adjusted using triethanolamine (TEA). The oil phase of the emulsion was prepared by dissolving Span 80 in light liquid paraffin while the aqueous phase was prepared by dissolving Tween 80 in purified water. Both the oily and aqueous phases were separately heated to 70° to 80°C; then the oily phase were added to the aqueous phase with continuous stirring until it got cooled to room temperature.

Emulgels have emerged as one of the most interesting topical delivery system as it has dual release control system i.e. gel and emulsion [1]. The major objective behind this formulation is delivery of hydrophobic drugs to systemic circulation via skin. In fact presence of a gelling agent in water phase converts a classical emulsion in to emulgel. The emulgel for dermatological use has several favorable properties such as being thixotropic, greaseless, easily spreadable, easily removable, emollient, non-staining, water-soluble, longer shelf life, bio-friendly, transparent & pleasing appearance [2].

Dermatological products applied to skin are diverse in formulation and range in consistency from liquid to powder but the most popular products are semisolid preparation. Within the major group of semisolid preparations, the use of transparent gels has expanded both in cosmetics and in pharmaceutical preparations. Gel formulations generally provide faster drug release compared with ointments and creams. In spite of many advantages of gels a major limitation is in the delivery of hydrophobic drugs. So to overcome this limitation, emulgels are prepared and with their use even a hydrophobic drug can enjoy the unique properties of gels. When gels and emulsions are used in combined form the dosage forms are referred as emulgels. In fact, the presence of a gelling agent in the water phase converts a classical emulsion into an emulgel. Direct (oil-in-water) system is used to entrap lipophilic drugs whereas hydrophilic drugs are encapsulated in the reverse (water-in-oil) system [2].

Benzyl benzoate is the organic compound with the formula $C_{14}H_{12}O_2$. It is the ester of benzyl alcohol and benzoic acid. It forms either a viscous liquid or solid flakes and has a weak, sweet-balsamic odor. It occurs in a number of blossoms (e.g. tuberose, hyacinth) and is a component of Balsam of Peru and Tolu balsam [3]. It is on the World Health Organization's List of Essential Medicines, a list of the most important medication needed in a basic health system [4].

Benzyl benzoate is used as an acaricide, scabicide, and pediculicide in veterinary hospitals. It is also a repellent for chiggers, ticks, and mosquitoes. It is an effective and inexpensive topical treatment for

human scabies. It has vasodilating and spasmolytic effects and is present in many asthma and whooping cough drugs [5].

There are different types of scabies and the most dangerous is crusted scabies [6]. This crusted scabies is uncommon type of scabies and its mortality rate is up to 50% over 5 years [7]. The distribution of this skin disease is worldwide, all groups of population are susceptible to scabies, for example all races, ages and social levels [8]. Different parameters are used to evaluate the efficiency of the prepared formulation, these are the rheological properties and the in vitro release of medicament from the formulation [10].

II. Materials And Methods

Materials

Benzyl benzoate, olive oil, soft paraffin, methylcellulose, Span 80, Carbopol 934 (Sigma Aldrich, St. Louis, MO USA).

Methods

Preparation of different types of topical formulations

1. Benzyl benzoate lotion; 25% of benzyl benzoate in olive oil
2. Benzyl benzoate emulsion; 25% of benzyl benzoate, 5% of Span 80, and 70% of water
3. Benzyl benzoate ointment, 25% of benzyl benzoate in soft paraffin
4. Benzyl benzoate gel; 25% of benzyl benzoate in methyl cellulose gel
5. Benzyl benzoate emulgel; benzyl benzoate emulsion mixed with 10 gm of Carbopol 934 gel
6. Benzyl benzoate emulgel; benzyl benzoate emulsion mixed with 20 gm of Carbopol 934 gel.
7. Benzyl benzoate emulgel; benzyl benzoate emulsion mixed with 30 gm of Carbopol 934 gel

Preparation of emulgel

A gelling agent Carbopol 934 was dispersed in purified water. The pH 6-6.5 was adjusted using a TEA. The oil phase of the emulsion was prepared by addition of 5% of Span 80 to benzyl benzoate in, then mixing with various concentration of Carbopol 934 gel viz. 10 gm, 20 gm and 30 gm and adjusting the volume to 100 ml by purified water.

Measurement of the rheological properties

This was achieved by the use a Rheometer Physica MCR 301 type: Cone and plate 50-1 (Anton Par Gmbh, Graz, AUSTRIA).

In vitro release studies

The in vitro drug release studies were carried out using Franz diffusion cells. The formulation was applied on cellulose acetate synthetic membrane with 0.45 μ m pore size which was placed between donor and receptor compartment of the FD cell. Phosphate buffer pH 7.4 was used as a dissolution media. The temperature of the cell was maintained at 37°C. This whole assembly was kept on a magnetic stirrer and the solution was stirred continuously using a magnetic bead. Sample (1 ml) was withdrawn at suitable time intervals and replaced with equal amounts of fresh dissolution media. Samples were analyzed spectrophotometrically at 256 nm [14] and the cumulative percent drug release was calculated.

III. Results

Table 1 Viscosity of different types of formulations by using Rheometer

Types of Formulation	Viscosity (Pa.s)
Benzyl benzoate 25% lotion	0.198
Benzyl benzoate 25% emulsion	0.578
Benzyl benzoate 25% methylcellulose gel	239
Benzyl benzoate 25% emulgel (containing 10g Carbopol 934 gel)	413
Benzyl benzoate 25% ointment	489
Benzyl benzoate 25% emulgel (containing 20g Carbopol 934 gel)	1250
Benzyl benzoate 25% emulgel (containing 30g Carbopol 934 gel)	1550

Standard calibration curve for benzyl benzoate

A standard linear graph was obtained from benzyl benzoate standard sample. The absorbance of benzyl benzoate was determined by using UV-Visible Spectrophotometer at wavelength of 256 nm, the maxima absorption for benzyl benzoate [15].

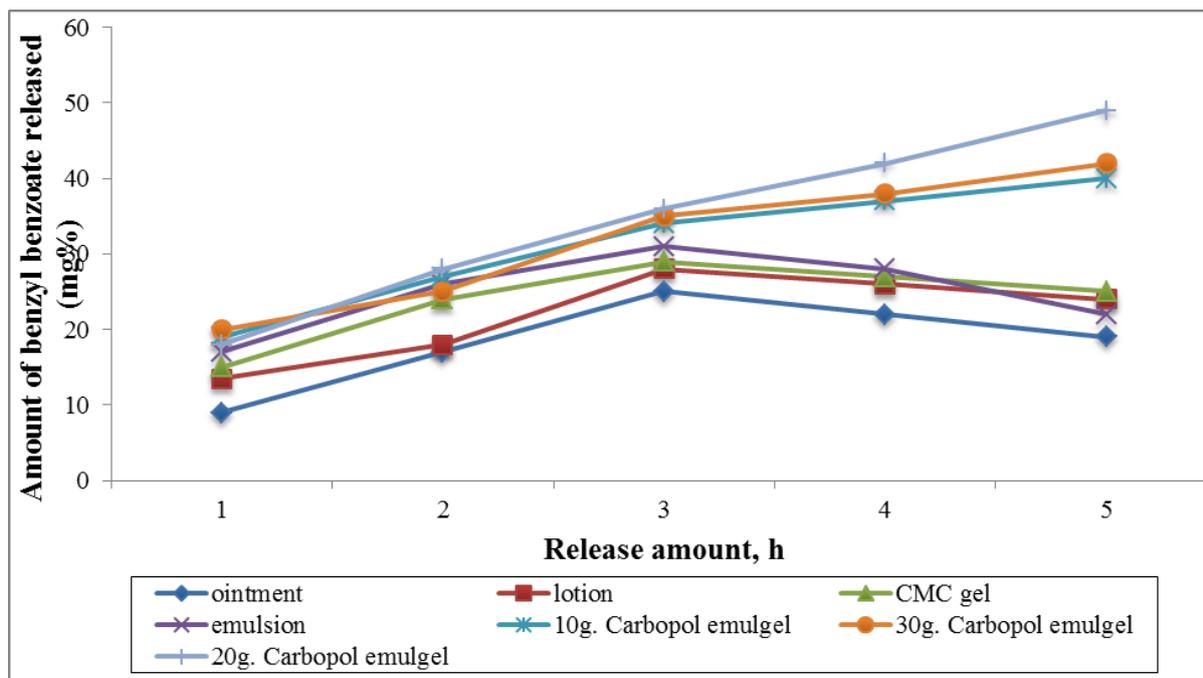


Fig 1: The amount of benzyl benzoate released from different topical preparations after 5 hours.

The tested formulations can be arranged in the following descending order according to the release of benzyl benzoate from them : emulgel containing 20 gm of Carbopol 934 > emulgel containing 10 gm of Carbopol 934 > lotion > gel > ointment.

IV. Discussion

Emulgels as novel dosage form are more efficient in releasing benzyl benzoate than other conventional external dosage form such as lotion, ointment, gel and emulsion. Emulgels prepared by mixing a gelling agent Carbopol 934 with the already prepared emulsion has released the largest amount of benzyl benzoate as proved by the release studies using Franz diffusion cell. Also the viscosity of the externally applied dosage form may play an important role in the release of medicaments, since higher viscosity preparation released a less amount of benzyl benzoate as seen from results of rheology and release.. However, for emulgel the benzyl benzoate released is not dependant on viscosity only. Composition of the emulgel itself influences the amount of benzyl benzoate released. This emulgel is the combination of gel and emulsion, hence emulgel has dual release system which is emulsion and gel.

These results are similar to those obtained by other authors [16-19] In addition, emulsion of benzyl benzoate showed higher drug released as compared with other dosage form. This may be attributed to the homogeneity of the emulsion system in which all the globules of the drug are reduced in size, which enhances the release of the incorporated medicament. Ointment of benzyl benzoate released a relatively small amount of drug despite the fact that it has a low viscosity. This may be due to the complete miscibility of this hydrophobic drug with soft paraffin and as a consequent little ability to leave the fatty base.

V. Conclusion

Emulgel represents a solution for incorporating hydrophobic drugs as benzyl benzoate in a water-soluble gel bases. Thus it is recommended for formulation of benzyl benzoate since the release and consequently the effectiveness and availability of the medicament is greatly increased than other topical formulations. It was noticed that addition of 20% of Carbopol 934 gel is better than preparations containing 10 and 30%.

Conflict Of Interest

We declare that we have no conflict of interest.

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