

Innovative Waterless Hydrophilic Topical Foam*

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Introduction

Foam is widely considered to be the future delivery form for dermatological drugs. Rubbing creams or ointments into the skin is less efficient and less convenient. Future skin-care patients are likely to receive their treatments in foam that can easily be spread across large areas of the body with minimum hassle and maximum absorption (1-3). Since many drugs are water insoluble or water sensitive, they should be formulated in waterless vehicles. While water – containing foams are known, we undertook the challenge of making foam based on pharmaceutically-acceptable polar solvents, as vehicle for a variety of drugs.

Objectives

Our objective was to develop a new type of hydrophilic waterless foam vehicle based on propylene glycol (PG) as main excipient. This novel foam was developed to incorporate water insoluble drugs and unstable drugs that are difficult to formulate in aqueous medium. There were two primary challenges in front of us:

- Preparing a formulation which produces a stable foam upon release from a pressurized aerosol can
- Producing a foam which should be easy to apply with slight rubbing, non greasy, non sticky, non shiny and well absorbed.

Methods

- Foams were produced by compounding PG, together with glycerin and additional polar solvents, e.g., dimethyl isosorbide. Additional formulation components included polymers, such as hydroxypropyl cellulose, low-HLB surfactants and fatty alcohols.
- Prototype foams were subjected to a set of chemical and physical tests:
 - API concentration, foam quality, color, odor, canister's shakability, density, hardness, collapse time, expansion time etc.
 - The aim of those tests is to ensure that the client will receive best foam that possible.

Drugs Foam Products

Several steroids PG based foams were prepared. The following Table demonstrates excellent stability for all foams:

Product	T ₀	1 Month		Degradation Products
		25°C	40°C	
Betamethasone Valerate 0.12%	0.117	0.108	0.110	Below limit of detection
Clobetasol Propionate 0.05%	0.052	0.051	0.049	
Betamethasone Dipropionate 0.05%	0.047	0.049	0.047	
Fluocinolone Acetonide 0.025%	0.024	0.024	0.024	
Hydrocortisone Butyrate 0.1%	0.097	0.094	0.093	

PG based foams were also used for non-steroid API's such as Minoxidil and Acyclovir.

Results and Conclusions

- Propylene glycol - based waterless foams offer a **superior topical delivery system**.
- They are useful in delivering **water-sensitive drugs**
- **Full disolution** of hydrophilic and lipophilic drugs (e.g., mupirocin, acyclovir, insoluble corticosteroids).
- **Excellent stability**.
- **Well absorbed** with no need of extensive rubbing
- **No residual sticky feeling** or shiny look.
- High **humectant effect**, as expected from PG and glycerin
- **Penetration** enhancement

References

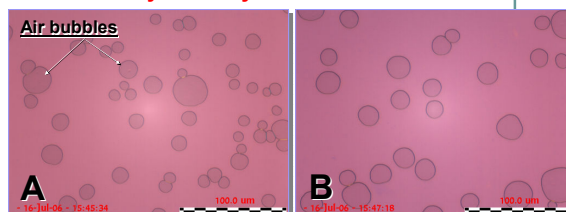
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Microscopic Observations

Betamethasone Dipropionate Foam:

- (A) 5°C after four weeks
(b) 40°C after four weeks

Full solubility • No crystals



Foamix Foam

60% Alcohol Foam



T = 0



T = 10 Sec



T = 20 Sec

Clear Advantages:

Foamix - **stable** before application

➤ **Facile application and spreading**

Hydroalcoholic foam instantly **melts** on skin

➤ **Complicated application**

➤ **Impossible spreading on large areas**

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By incorporating drugs in foam, Foamix creates premium products with improved convenience, higher compliance and better efficiency of treatment.