

# **Humco's SaltStable LS Advanced™**

## **Transdermal Penetration Study**

**5% Ketamine + 10% Gabapentin + 0.2% Clonidine + 2% Baclofen**

### **Study**

#### **Evaluation of the Percutaneous Absorption of Ketamine HCl + Gabapentin + Clonidine HCl + Baclofen, In SaltStable LS Advanced™, Into Human Skin, In Vitro, Using the Franz Skin Finite Dose Model**

Using Humco's SaltStable LS Advanced™ the study was designed to evaluate the percutaneous absorption pharmacokinetics of ketamine HCl, gabapentin, clonidine HCl and baclofen. Absorption was measured in human epidermal cultures, in vitro, using the finite dose technique and Franz Diffusion Cells. The four drugs were selected due to their frequent use in compounding topical pain formulations along with compounding multiple actives in one formulation.

The formula was tested on standardized sections with Humco's SaltStable LS Advanced™ transdermal compounding base, for the percutaneous absorption of ketamine HCl, gabapentin, clonidine HCl and baclofen over a 48-hour dose period. At pre-selected times after dose application, the dermal receptor solution was removed in its entirety, replaced with fresh receptor solution, and an aliquot saved for subsequent analysis. High Performance Liquid Chromatography (HPLC) analyzed the samples for ketamine HCl, gabapentin, clonidine HCl and baclofen content.

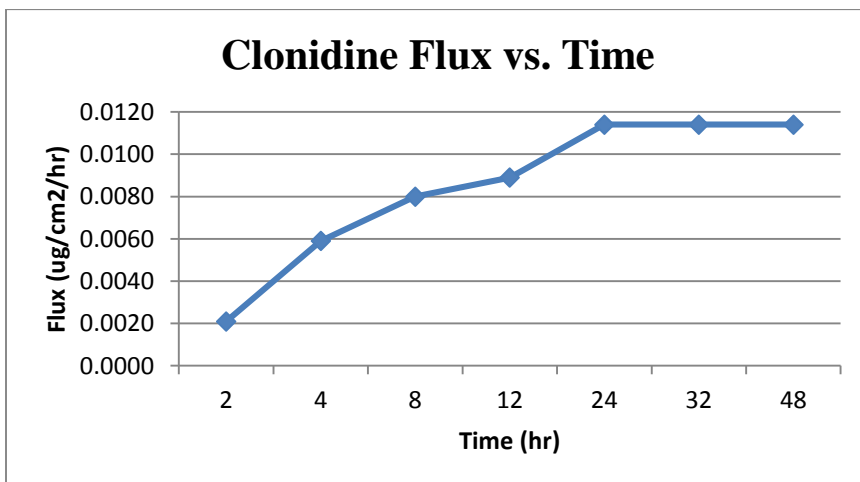
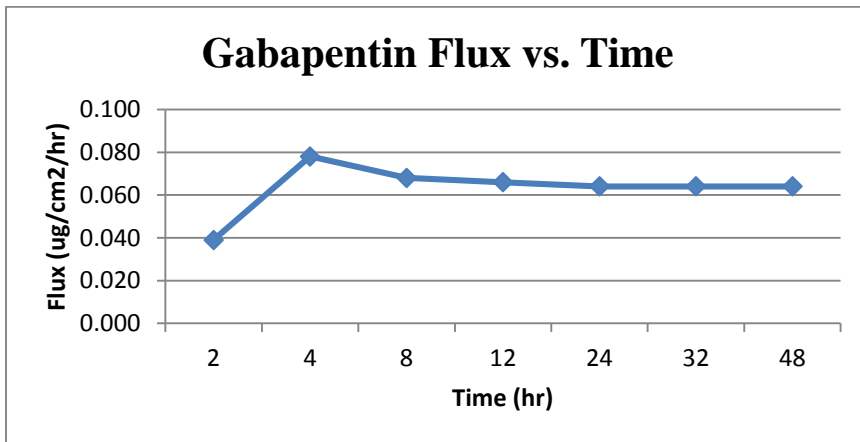
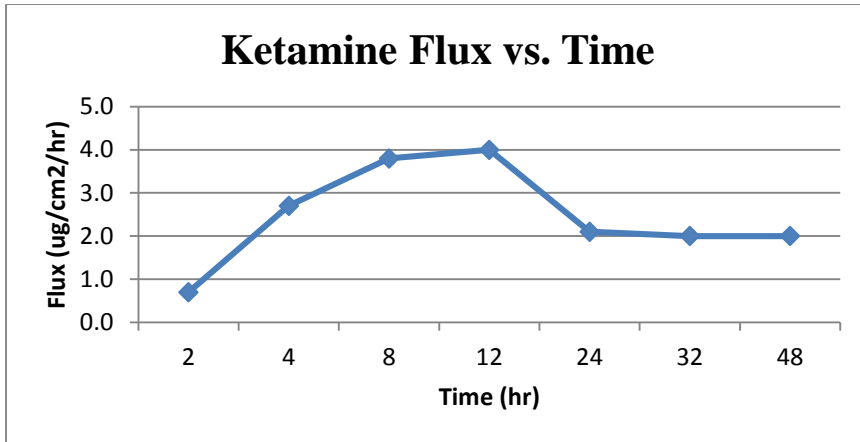
The in vitro human Epiderm skin model has proven to be a valuable tool for the study of percutaneous absorption and the determination of the pharmacokinetics of topically applied drugs. The model uses human epidermal skin mounted in specially designed diffusion cells that allow the skin to be maintained at a temperature and humidity that match typical in vitro conditions. A finite dose of formulation is applied to the outer surface of the skin and drug absorption is measured by monitoring the rate of appearance in the receptor solution bathing the inner surface of the skin. Data defining total absorption, as well as rate of absorption can be accurately determined in this model.

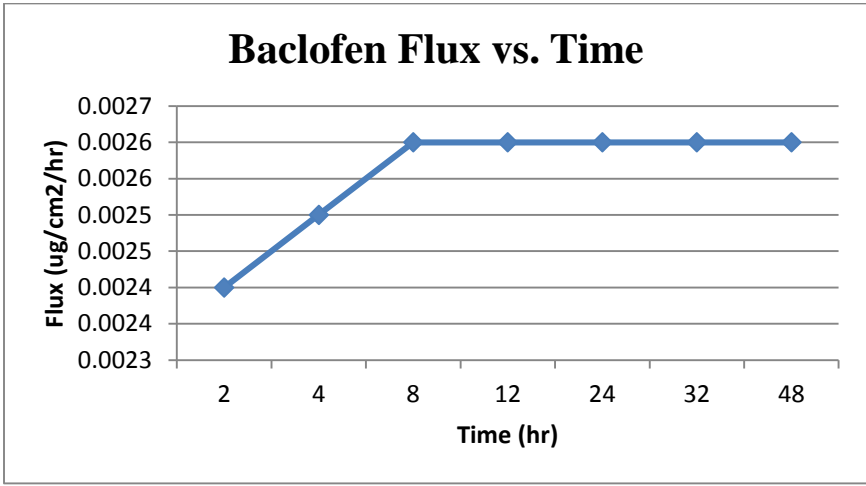
### **Results**

Humco's SaltStable LS Advanced™ compounding base is a proven transdermal delivery vehicle able to deliver multiple drugs beyond the stratum corneum, simultaneously into and through the human skin after a single dose.

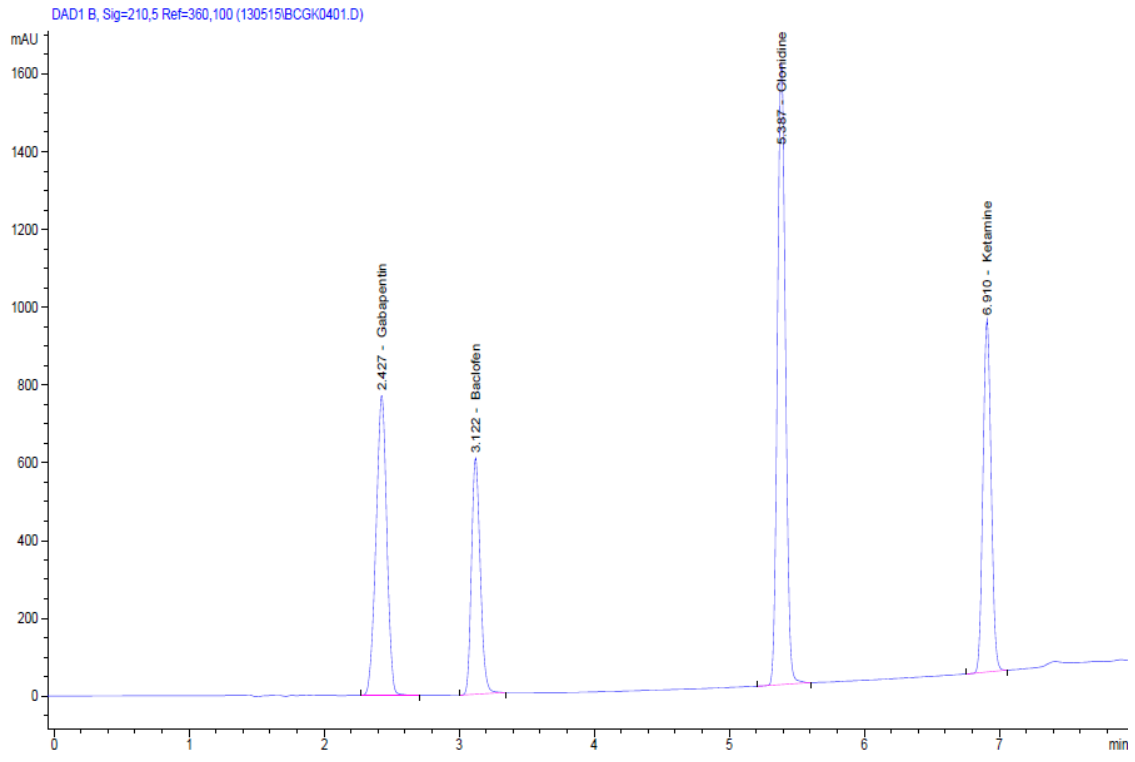
The data indicates that Humco's SaltStable LS Advanced™ delivered ketamine HCl, gabapentin, clonidine HCl and baclofen simultaneously (and intact) into and through human epidermal cultures, in vitro, from the test formulation provided.

The absorption profiles indicate a rapid penetration to a peak flux for gabapentin occurring at approximately 4 hours after dose application, and for baclofen occurring at approximately 8 hours after dose application. The absorption profiles indicate a steady penetration to a peak flux for ketamine HCl occurring at approximately 12 hours after dose application, and for clonidine HCl occurring at approximately 32 hours after dose application.





Sample Chromatogram of Ketamine HCl / Gabapentin / Clonidine HCl / Baclofen



Tested Formula

5% Ketamine + 10% Gabapentin + 0.2% Clonidine + 2% Baclofen + SaltStable LS Advanced - q.s. – 100%